



The behavior of French retail investors : issues within the MiFID directive

Hava Orkut

► To cite this version:

Hava Orkut. The behavior of French retail investors : issues within the MiFID directive. Economics and Finance. Université de Strasbourg, 2018. English. NNT : 2018STRAB010 . tel-02366219

HAL Id: tel-02366219

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ÉCOLE DOCTORALE AUGUSTIN COURNOT (ED-221)
Laboratoire de Recherche en Gestion et Économie (LaRGE)

THÈSE

présentée par :

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soutenue le : **10 décembre 2018**

pour obtenir le grade de : **Docteur de l'Université de Strasbourg**

Discipline : Science de Gestion

Spécialité : Finance

**Le comportement des investisseurs individuels français :
enjeux dans le cadre de la directive MiFID**

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À ma famille,

« L'Université de Strasbourg n'entend donner aucune approbation ni improbation aux opinions émises dans les thèses : ces opinions doivent être considérées comme propres à leurs auteurs. »

Remerciements

J'aimerais tout d'abord adresser mes remerciements les plus sincères à ma directrice de thèse, Madame le Professeur Marie-Hélène Broihanne, d'avoir accepté de diriger ce travail. Je lui suis très reconnaissante pour les multiples conseils avisés et précieux qu'elle m'a donnés tout au long de ce travail de recherche. Ses qualités pédagogiques et scientifiques m'ont permis d'avancer régulièrement et efficacement dans ma thèse. Je lui exprime toute ma gratitude pour sa gentillesse, son efficacité et pour le temps qu'elle a dédié à lire mes travaux de recherche. J'admirerai toujours son organisation et son travail discipliné. Je ne la remercierai jamais assez pour sa disponibilité.

Je tiens à remercier le Professeur Sébastien Pouget, le Professeur Catherine D'Hondt, le Professeur Jean-François Gajewski, le Professeur Maxime Merli et Mme Claire Castanet pour avoir accepté de participer à mon jury de thèse et pour le temps qu'ils ont consacré à la lecture de ce travail.

Je remercie vivement les directeurs de l'École Doctorale Augustin Cournot, Messieurs les Professeurs Jocelyn Donze et Christophe Godlewski, ainsi que le directeur du laboratoire de recherche, Monsieur le Professeur Laurent Weill, pour leur disponibilité. J'adresse mes chaleureux remerciements à notre gentille secrétaire, Danielle. Je remercie sincèrement Monsieur le Professeur Patrick Roger pour ses précieux commentaires. Je remercie également Marie Pfiffelmann de m'avoir confiée le cours de finance d'entreprise pendant la thèse.

Un grand merci à mes amis doctorants que j'ai rencontrés en thèse, et plus particulièrement à Thomas, Guillaume et ma petite Pauline pour notre bonne ambiance au bureau. Merci à Carolin pour son soutien et ses conseils. Merci à l'équipe organisatrice des ACDD 2017: Lucie, Jeanne, Narimène, Marie, Simon, Rémy, Mischaël et ma chère Alexandra, avec qui j'ai commencé cette aventure. Merci à Sila et Emre pour leur disponibilité.

Un immense merci à Stéphanie et Alexis qui, malgré la distance, m'ont toujours soutenue. Je suis tellement heureuse de vous connaître.

Je remercie du fond du cœur Véronique et Thierry pour leur confiance sans faille.

J'adresse mes plus chaleureux remerciements à mes parents pour leur soutien indéfectible dans mes études. Ils ont créé les meilleures conditions pour que mon frère et moi puissions atteindre nos objectifs. Leur présence et leur tendresse me sont tellement précieuses. Mention spéciale pour mon frère, Sinan, qui m'a toujours motivée dans tout ce que j'ai entrepris. Sa bonne humeur et son incroyable énergie m'ont permis d'être optimiste dans les moments les plus difficiles!

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Introduction

In nowadays finance research, a growing interest is devoted to retail investors because they make investment mistakes which are hardly in line with what standard financial theory predicts (Sharpe, 1964, Lintner, 1965 and Mossin, 1966). Investment involves making decisions under uncertainty, which is a complex task. To ease this decision-making process, retail investors operate some mental shortcuts, or heuristics, leading to investment mistakes which result in poor performance and excessive risk-taking. The behavioral finance literature attempts to highlight these mistakes and shows that they can be explained by behavioral biases to which retail investors are subject.

Some behavioral biases were identified empirically and/or experimentally all around the world. For instance, retail investors fail to diversify their portfolios and then, to reduce the impact of the specific risk on their investment expected performance (e.g. in the US (Goetzmann and Kumar, 2008), France (Broihanne et al., 2016) and China (Feng and Seasholes, 2008)). They are reluctant to sell their assets that incur some losses, which result in poor performance as the value of losers continues to decrease (e.g. in the US (Shefrin and Statman, 1985), Belgium (Bellofatto et al., 2018) and Australia (Frino et al., 2015)). Finally, retail investors trade too much because they are overconfident and this also deteriorates their portfolio's performance (e.g. in the US (Odean, 1999), the UK (Merkle, 2017) and Turkey (Tekçe and Yilmaz, 2015)). Although these behavioral biases are well-known, they are still exhibited by retail investors. Therefore, understanding *ex ante* what drive retail investors' decisions is essential.

According to the literature, the main determinants of individual investment behavior are socio-demographics (e.g. gender (Barber and Odean, 2001), age (Korniotis and Kumar, 2011)) and wealth indicators (e.g. income (Shum and Faig, 2006), bank loans (Cardak and Wilkins, 2009) and portfolio value (Bauer et al., 2009)). Elicited through surveys, some individual psychological characteristics are also shown to drive investment behavior, such as risk tolerance (Hoffmann et al., 2015), loss aversion (Dimmock and Kouwenberg, 2010) and financial literacy (van Rooij et al., 2011). The study of retail investors makes then necessary to control for this variety of individual characteristics to provide more relevant insights into their investment behavior (Dorn and Huberman, 2005, Dorn and Sengmueller, 2009, Hoffmann et al., 2013 and Bianchi and Tallon, 2018).

Although retail investors' financial behavior is well-documented in the behavioral finance literature,

an extension of the analysis of *retail investors* to the one of *bank retail clients* would depict a more comprehensive picture on investment behaviors and be exempt of any selection bias. For example, considering retail clients would enable to accurately identify the determinants of savings decisions, such as opting for regulated savings accounts and/or home savings plans for example, and not only those of financial product investment decisions, in stocks, bonds, unit-linked life insurance products, etc. Such an analysis would be exempt of any selection bias as it would be representative of the whole population among which some individuals are investors. Examining retail clients' investment decisions is therefore expected to help clarifying their role and thus to address this gap in the literature. Aside from investment decisions, it would be helpful to highlight which investment vehicle(s) is (are) the most appropriate to individuals depending on their risk profile and financial knowledge.

In this respect, the Markets in Financial Instrument Directive II (2014/65/UE) or MiFID II, which was implemented in January 2018¹, could play a major role in improving retail investors' financial knowledge and in determining their risk profile. Actually, MiFID II aims to reinforce the protection of retail investors depending on their financial knowledge by requiring investment service providers to administer a questionnaire, the *MiFID questionnaire*, to their clients in order to gather a detailed set of information on them. The goal of the Directive is that, provided with these data, financial advisors will establish the risk profile of their clients and provide them services that are suited to their financial situation.

The purpose of this dissertation is to draw an accurate picture of the behavior of French retail clients/investors in financial markets by reconciling the academic literature with policy decision-making. Our research work focuses on three main directions. First, we identify the determinants of stock market participation (Chapter 2) by considering a sample which is characterized by gender parity and which is representative of the whole French population. Our original approach in this chapter is to test whether clients' MiFID questionnaire answers explain their decision to invest in stocks, i.e. to become investors. Second, we analyze retail clients' self-assessed investment goals in the MiFID questionnaire together with their actual investment decisions under the theoretical framework of mental accounting (Chapter 3). The availability of data on both intended goals and investment decisions offers the opportunity to investigate for the first time whether retail clients' investment goal choices are consistent with their investment decisions. Finally, we study foreign stock investment or, equivalently investor sophistication (Chapter 4). We investigate whether the most sophisticated investors, i.e. those directly holding at least one foreign stock, diversify always better their portfolios than the least sophisticated ones regardless of the type of financial products. Thanks to the MiFID questionnaire answers, we investigate whether the most sophisticated investors significantly differ from the least sophisticated ones regarding their risk tolerance, sensitivity to losses and financial literacy. We additionally test

¹MiFID II replaces MiFID I (2004/39/EC) that was implemented in 2007.

whether sophisticated investors suffer from the home bias despite of investing overseas.

In this dissertation, we have the opportunity to conduct a joint study of the MiFID questionnaire answers (*Dataset 1*) and banking records (*Dataset 2*) of retail clients of a large European retail bank². The mandatory data collection under MiFID allows to consider a large sample composed of more than 98,000 retail clients over the 2007-2015 period³. In the literature, declared data (that are usually elicited through surveys and then subjective) and brokerage or administrative data (that are observable and then objective) are seldom analyzed together (Dorn and Huberman, 2005, Dorn and Sengmueller, 2009, Hoffmann et al., 2013, 2015, Hoffmann and Post, 2017, Bellofatto et al., 2018, Bianchi, 2018 and Bianchi and Tallon, 2018).

Compared to household surveys, MiFID questionnaire answers are more reliable because retail clients may give relevant and honest answers to benefit well-suited advice from their financial adviser. More importantly, the sample is exempt of any selection bias leading us to not solely focus on retail investors but to analyze the behavior of retail clients, some of them only hold a current account within the bank and do not participate in the financial markets. Consequently, men and women are equally represented in our sample, while men are usually over-represented in other studies on the behavior of retail investors (Barber and Odean, 2001, Goetzmann and Kumar, 2008 and Hoffmann et al., 2013, 2015). Therefore, in this dissertation, we are able to control for any usual gender differences in risk aversion (Charness and Gneezy, 2012), loss aversion (Rau, 2014) and financial literacy (Bucher-Koenen et al., 2017). Although considering only the MiFID questionnaire answers of one bank might be a drawback, we collected a rich dataset of answers over at most three identical successive questionnaires. Moreover, our sample is representative of the whole French population regarding socio-demographics and wealth, including the net monthly income, the bank loan amounts, savings account and financial product holdings, providing thus the opportunity to give a general perspective to our results.

Finally, in France, the study of MiFID data together with banking data has not yet been conducted. MiFID questionnaire answers were previously analyzed in Italy (Mazzoli and Marinelli, 2014) and in Belgium (D'Hondt and Roger, 2017 and Bellofatto et al., 2018). In this dissertation, we gather a higher number of retail clients than the one of these studies and we focus on a variety of subjective attitudes and characteristics regarding savings and investment decisions.

Aside from using for the first time MiFID data in France, the overall findings of this dissertation contribute both to the behavioral finance literature and to financial regulations at a operational standpoint for the following reasons.

²These data were provided thanks to the AMF (*Autorité des Marchés Financiers*) by an anonymous European retail bank. We are also thankful to the OEE (*Observatoire de l'Épargne Européenne*) for the financial support.

³Throughout this dissertation, we consider MiFID I because the MiFID questionnaire was administered to retail clients between 2007 and 2015. MiFID II came into force from January 2018.

At the academic level, our findings contribute to the extent literature on the behavior of French retail investors/clients. To date, French studies focused on a broad range of financial concepts, such as identifying some behavioral biases of French investors (the disposition effect (Boolell-Gunesh et al., 2009, 2012) and the (under-) diversification bias (Broihanne et al., 2016)), examining stock return volatility (Foucault et al., 2011), stock market reaction (Siwar, 2011), stock market participation (Arrondel et al., 2010 and Arrondel et al., 2015), investor trading performance (Magron, 2012, 2014), herding behavior (Merli and Roger, 2013), investor attention (Aouadi et al., 2013), developing a market sentiment index (Roger, 2014) and, more recently, analyzing the relationship between financial literacy (Bianchi, 2018) or ambiguity preferences (Bianchi and Tallon, 2018) and portfolio rebalancing.

At the operational level, our findings contribute to the policies conducted by the European regulators, such as the *Autorité des Marchés Financiers* (AMF) and the European Securities and Markets Authority (ESMA), and to the current debate on the usefulness of the MiFID questionnaire. Specifically, this dissertation investigates whether the MiFID questionnaire truly highlights retail clients' profile and, additionally, gives some recommendations for improving it, especially regarding questionnaire length and the order in which questions should be treated to get high data reliability.

This dissertation is organized around four chapters.

The first chapter, untitled “The behavior of retail investors in the light of MiFID”, introduces the literature in which this dissertation lies. We first examine psychology research to have a quick overview on how individuals operate choices when they face complex tasks. This preliminary overview enables to introduce the behavior of retail investors in financial markets by describing the most often-quoted behavioral biases in the literature and their most common determinants. We present MiFID and the specific MiFID questionnaire of the retail bank that provided us with the data. We carry out an in-depth analysis of this MiFID questionnaire while considering some framing effects and giving some recommendations in order to improve it. We then describe finely banking records and shed light on some specific information rarely available in other databases, such as the country of birth or the department of residence, but also on information that have not yet been explored, such as the choice of the matrimonial regime. We provide descriptive statistics on the MiFID questionnaire answers and on banking records while comparing our results to those of prior studies and to those of the French national statistics bureau (INSEE). Finally, a specific analysis is dedicated to unreported answers and to answers stability over successive questionnaires.

The second chapter, untitled “MiFID questionnaire answers and stock market participation”, aims to identify the determinants of stock market participation of more than 70,000 retail clients in France. This question is important because it is well documented that stock market participation is low all around the world (e.g. the US (Mankiw and Zeldes, 1991, Haliassos and Bertaut, 1995 and Poterba and Samwick, 1995), the UK (Attanasio et al., 2002) and France (Arrondel et al.,

2015)). We have the opportunity to study stock investment decision in a sample which is characterized by gender parity. Our findings are then exempt of any stockholding differences between men and women (Barber and Odean, 2001 and Agnew et al., 2003). In France, stock market participation was already addressed by (Arrondel et al., 2015). These authors use self-declared data coming from a 2011 household survey, whereas in this chapter, data on stockholdings are real data that are recorded in the bank computer system thus ensuring a higher reliability of our findings. In this chapter, we show that MiFID indicators, i.e. self-assessed risk tolerance and attitudes towards losses, are stronger determinants of the decision to hold stocks than classical determinants, such as gender, age and income (Barber and Odean, 2001 and Korniotis and Kumar, 2011). We find that retail clients with a high risk tolerance level and/or a low sensitivity to losses are more likely to participate in the stock market. Besides, specific socio-demographic indicators, namely the country of birth, the region of residency and, interestingly, the choice of the matrimonial regime, also explain stock investment decision. Indeed, we find that being native-born, living in the Paris region and opting for the separation of property regime promote stockholding. Furthermore, holding other investment vehicles, such as unit-linked life insurance products and/or retirement plans, has a positive and significant impact on stock investment. Our findings are robust when we consider retail clients' financial experience, their familiarity with the MiFID questionnaire or with the stock market, and their financial literacy. This chapter brings useful insights for both academics and practitioners on the usefulness of the MiFID questionnaire answers because we show that using such data can be helpful to detect which retail clients are the most likely to participate in the stock market. We thus suggest to MiFID questionnaire developers to deserve more attention in assessing retail clients' attitudes towards risk and towards losses in order to provide them with the most suitable advice and financial products.

The third chapter, untitled “Investment goals and mental accounting in French retail clients”, studies the impact of self-assessed investment goals on the actual investment choices under the theoretical framework of mental accounting. Introduced by Thaler (1985)⁴, mental accounting describes the way individuals organize, evaluate and keep track of their financial activities (Thaler, 1999). Setting investment goals is an important step that might occur before making any financial decision. Our view is that assessing investment goals in the mandatory MiFID questionnaire may encourage individuals to develop *ex ante* a financial discipline around savings and investments. For example, individuals may set a monthly direct debit for building an education fund for their children if this goal is clearly expressed in the questionnaire answers. The availability of data on both self-assessed investment goals and real investment decisions for an identical set of individuals provides the unique opportunity to test whether intended goals set by individuals impact their real decision-making. In this chapter, we study the self-assessed investment goals of more than 60,000 retail clients together with their investment decisions which are available in banking records. We first derive a retail client mental

⁴The 2017 Nobel Laureate in Economics.

goal typology from their investment goals. Actually, we categorize self-assessed investment goals into mental goals while being in line with the literature on funds categorization. Two empirical tests are then performed. The first test identifies the determinants of the number of investment goals and shows that holding savings accounts and/or financial products has a positive and significant impact on investment goal “diversification”. The second test shows that retail clients’ actual investment decisions fit their mental goals. Specifically, we find that mental goals are key drivers of real investment decisions since they increase the likelihood to invest in the corresponding investment vehicles by around 10% to 20%, while the classical determinants increase it less than 1%. In this chapter, we directly and for the first time, build a test of the theoretical mental accounting process by combining retail clients’ self-assessed investment goals to their real investment decisions. We also give an academic justification of the use of MiFID questionnaire answers because self-assessed investment goals contribute significantly to explain both savings account and financial product investment decisions. At the operational standpoint, we show that investment service providers seem to achieve their objectives because real investment decisions are consistent with investment goals of retail clients. Assessing investment goals in the MiFID questionnaire could then encourage retail clients to achieve their goals and to establish a financial discipline around savings and investments.

The fourth chapter, untitled “Foreign stock investment and sophistication of French retail investors”, tackles the decision to invest in foreign individual stocks among over 7,000 retail investors, i.e. retail clients holding stocks either directly or indirectly through mutual funds. In France, Boolell-Gunesh et al. (2012) consider trading foreign assets as a proxy for investor sophistication and show that “sophisticated” investors are less prone to the disposition effect. In the US, Goetzmann and Kumar (2008) find that investors trading foreign assets hold better domestic stock portfolios. Trading foreign assets is then usually associated with a high portfolio diversification level. Motivated by these findings, we consider any investor to be “sophisticated” if he/she directly holds at least one foreign stock. Therefore, we use a direct measure of investor sophistication since we only consider retail investors’ own decision to invest in stocks instead of any indirect decision which is addressed through mutual funds. We first highlight the significant differences between retail investors and retail clients on a clear majority of variables, which are in line with the literature on stock market participation. The study of foreign stock investment, or equivalently, investor sophistication leads to consider two investor groups depending on whether they hold at least one foreign individual stock (*Foreign investors* or *F-investors*) or not (*Domestic investors* or *D-investors*). To ensure that no significant differences are observed between the two groups, except for the decision to invest in foreign stocks, we perform a matching method which consists in pairing each *F-investor* with a *D-investor* who is similar on a set of observable covariates. From the “matched” sample, we compare *F-* and *D-investors* regarding their global portfolio diversification choices and their MiFID questionnaire answers. We first show that the more sophisticated investors (*F-investors*) diversify better in stocks and warrants at both

national and international levels than the least sophisticated (*D-investors*) who, in turn, diversify better in mutual funds, bonds, unit-linked life insurance and retirement plans. Then, we show that *F-investors* are significantly more risk tolerant, less sensitive to losses and more financially literate than *D-investors*. Finally, we find that *F-investors* suffer from the home bias. We show that the home bias weakens as *F-investors* get older, for investors who exhibit a low sensitivity to losses or a high financial literacy. Interestingly, interacting financial literacy and age gives interesting insights on the impact of the decline of cognitive abilities with age on the home bias. Besides, native-born and self-employed are less home-biased than foreign-born and salaried. Finally, the home bias increases with portfolio value. Our findings highlight for the first time the informativeness of the MiFID questionnaire to explain retail investors' international portfolio allocations. We encourage MiFID questionnaire developers to develop questions to detect which retail investors are the most likely to invest overseas, or equivalently, to identify the most sophisticated investors. Such an *ex ante* profiling of investors would help advisors to encourage international portfolio diversification of their clients' portfolios who in turn would benefit from it.

In this dissertation, we empirically show that MiFID questionnaire answers contribute to a better understanding of the behavior of retail investors/clients in financial markets. We highlight the informativeness of MiFID questionnaire answers at both academic and operational levels. We give an academic justification for using the MiFID questionnaire because we find that retail clients' answers, especially regarding their risk tolerance, attitudes towards losses, financial literacy and investment goals, have a significant impact on their investment decisions. More importantly, our results are robust as the mandatory data collection through the MiFID questionnaire provides us with the opportunity to consider a large number of retail clients. At the operational level, in this dissertation, we highlight the ability of the MiFID questionnaire to derive retail clients' risk profile and to ensure advice suitability, whichever we consider stock investment, the consistency between intended goals and real investment decisions or the decision to invest overseas.

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Chapter 1

The behavior of retail investors in the light of MiFID

1.1 Introduction

Diagnosing retail investors' behavior is one important concern of the behavioral finance literature because retail investors make errors in their financial decisions (Feng and Seasholes, 2005, Dhar and Zhu, 2006, Glaser and Weber, 2007, Goetzmann and Kumar, 2008, Talpsepp, 2010, Korniotis and Kumar, 2011, Barber and Odean, 2013 and Fuertes et al., 2014). Such errors have been shown to come from biases which have been commonly identified around the world¹, such as the diversification bias (Goetzmann and Kumar, 2008), the disposition bias (Shefrin and Statman, 1985) and overconfidence (Barber and Odean, 2001). These systematic biases lead investors to realize suboptimal investment choices.

Indeed, according to Markowitz's portfolio theory (Markowitz, 1952, 1959), investors must hold a large number of securities to eliminate idiosyncratic risk. However, retail investors hold under-diversified portfolios containing less than five stocks (Dorn and Huberman, 2005, Goetzmann and Kumar, 2008 and Anderson, 2013). Furthermore, retail investors are subject to the disposition bias, i.e. they have a high tendency to sell too soon "winning" securities and to conserve too long "losing" securities². This strategy generates losses because, on the average, prices of losing securities continue to decrease leading investors to realize sub-optimal investment choices (Odean, 1998a, Dhar and Zhu, 2006, Weber and Welfens, 2007, Boolell-Gunesh et al., 2009 and Frino et al., 2015). Finally, retail investors trade excessively in financial markets because they are overconfident (Odean, 1999, Barber and Odean, 2001, 2002, Statman et al., 2006 and Glaser and Weber, 2007).

¹Many behavioral biases have been identified in the literature. We refer here to the biases which are commonly observed in portfolio allocations of retail investors.

²By definition, a "winning" security is a security which price has increased since its purchased and a "losing" security is a security which price has decreased since its purchase.

These behavioral biases were deeply analyzed in the literature and some of their often-quoted determinants are common to a couple of biases (e.g. gender, age, income and education³). However, some studies also found that these biases could be attenuated (or even eliminated, in the case of the disposition effect pointed out by Feng and Seasholes (2005)) among some investors.

Aside from behavioral biases, limited stock market participation of retail investors is widely documented in the literature (Mankiw and Zeldes, 1991, Haliassos and Bertaut, 1995, Attanasio et al., 2002 and Arrondel et al., 2015). Stock market participation is weaker than the classical models would predict given the risk-adjusted return of stocks. In the US, Giannetti and Wang (2016) indicate that, on average, around 31% of households declared that they participate in the stock market⁴. In France, Arrondel et al. (2015) report that 30.4% of French households hold directly or indirectly stocks. The stockholding rate recently documented by Bianchi (2018) is around 34%⁵. In these studies, data related to stockholdings are extracted from surveys.

Although these phenomena are well-documented, there is however no way to detect, *ex ante*, which investors are the more likely to exhibit one or some behavioral biases. To achieve this goal, many detailed information on retail investors should be gathered beforehand. The Markets in Financial Instruments Directive (MiFID henceforth) requires investment service providers to get a thorough knowledge from their clients by using a questionnaire, called the *MiFID questionnaire*, to protect investors by offering them advice and financial products that are perfectly suited to their financial situation. Therefore, the academic study of the answers to such a questionnaire allows highlighting clients' characteristics, needs and preferences and also establishing their risk profile.

In this chapter, we analyze the MiFID questionnaire answers of more than 98,000 retail clients of a large European retail bank together with their banking records to accurately study their financial behavior. Only a small number of empirical studies combine declared data (which might be subjective) with brokerage or administrative data (which are objectively observable) in the literature (Dorn and Huberman, 2005, Hoffmann et al., 2013, 2015, Bellofatto et al., 2018, Bianchi, 2018 and Bianchi and Tallon, 2018). We show that the use of the MiFID questionnaire answers gives useful insights since retail clients are expected to give relevant answers to get the most appropriate advice from their financial adviser, which is not the major concern of questionnaires/surveys used in prior studies. By analyzing questions asked by the bank, we also highlight some framing effects. Consequently, we give some advices for improving questionnaire design.

This chapter is organized as follows. Section 1.2 reviews the behavioral finance literature. Section 1.3 describes MiFID. Section 1.4 provides an in-depth analysis of the MiFID questionnaire we consider throughout our work. Section 1.5 presents banking records. Section 1.6 reports the descriptive statis-

³Section 1.2 overviews the literature related to the determinants of the behavioral biases.

⁴They additionally note that, by including stocks held in the IRAs, stock market participation rate is around 43%.

⁵The survey was administered to the clients at the end of 2010. Specifically, it was completed on the internet while the clients were on the telephone with the surveyor.

tics. Section 1.7 focuses on unreported answers and on answers stability over successive questionnaires. Section 1.8 concludes.

1.2 Related literature

Financial market investment requires investors to take financial decisions under uncertainty in a complex environment. Research in psychology shows that when individuals face complex tasks, they operate some simple rules or mental shortcuts, called *heuristics*, to take decisions. However, the use of such heuristics leads them to behave differently from what classical decision-making theory (von Neumann and Morgenstern, 1947) predicts. Although relying on heuristic principles eases to predict values under uncertainty, individuals who use heuristics make erroneous judgments (Tversky and Kahneman, 1974). Tversky and Kahneman (1974) define three heuristics used in making judgments under uncertainty: the representativeness heuristic⁶, the availability heuristic and the anchoring and adjustment heuristic.

- The representativeness heuristic is usually used by individuals when they judge the probability that an event A belongs to a process B. By applying the representativeness heuristic, individuals evaluate the probability depending on the degree to which A is representative of B, i.e. by focusing on the similarities between A and B. Then, the more A is representative of B, the higher is the probability judged by individuals. To illustrate the judgment by representativeness, we give the example quoted by Tversky and Kahneman (1982). These authors describe a person named Linda in the following manner:

“Linda is 31 years old, single, outspoken, and very bright. She majored in philosophy. As a student, she was deeply concerned with issues of discrimination and social justice, and also participated in anti-nuclear demonstrations.”

Then, people have to choose the most likely assertion between statement A “Linda is a bank teller” and statement B “Linda is a bank teller and is active in the feminist movement”. Individuals assign the greater probability to statement B due to the description of Linda who sounds feminist. Since Linda is representative of a feminist, individuals are more likely to consider her as a feminist.

Other biases are associated with the representativeness heuristic. For example, individuals are insensitive to prior probability, or base-rate frequency, of outcomes. Indeed, Tversky and Kahneman (1974) show brief personality descriptions of individuals and ask subjects to assess, for each description, the probability that an individual is an engineer or a lawyer. Subjects are aware that individuals are extracted randomly from a group of 100 professionals in which lawyers represent 70% and engineers represent 30%. The authors replicate the experience by considering a group in which engineers represent 70% and lawyers represent 30%. Subjects are not sensitive to the initial proportions of lawyers and of engineers. On the contrary, they consider that an individual is a lawyer or an engineer depending on the

⁶Gualtieri and Denison (2018) study the representativeness heuristic among young children. Their experiments show that the representativeness heuristic develops during the preschool and specifically strengthen between 4 and 6 years old.

representativeness of the description whatever the probabilities associated with the socio-professional categories.

- The availability heuristic is often useful for individuals when they judge the probability of an event depending on the ease with which examples associated with that event come to their mind. Tversky and Kahneman (1974) give the following example to illustrate the availability heuristic:

“Suppose your sample a word (of three letters or more) at random from an English text. It is more likely that the word starts with r or that r is its third letter?”

As it is easier to think about words starting with r than about words in which r is the third letter, individuals judge that the number of words starting with r is larger than the number of words in which r states at the third position.

- The anchoring and adjustment heuristic consists in making estimations for unknown quantities, by starting from an initial value (which is often obtained easily), and then to adjust it. The anchoring heuristic results in erroneous decisions because adjustments are usually insufficient (Tversky and Kahneman, 1974). To illustrate this anchoring effect, Tversky and Kahneman (1974) use a spinning a wheel of fortune for extracting randomly a number comprised between 0 and 100. Results are communicated to subjects. Then, the following questions were asked to subjects:

“Is the number of African countries in the United Nations higher or lower than this quantity? How much do you estimate the number of African countries in the United Nations?”

Surprisingly, the (random) given number influences subjects’ estimation because they adjust by up-warding or down-warding the starting number to estimate the number of African countries in the United Nations. For example, the median estimates of the number of African countries in the United Nations is 25 for subjects for whom the starting number was 10 and 45 for whom the starting number was 65.

Such heuristics are also used in financial decision-making and, despite they may help at making decisions, they lead investors to make mistakes. The behavioral finance literature tends to shed light on these mistakes and show that some of them come from behavioral biases.

Some behavioral biases are identified all around the world irrespective of the sample (e.g. retail investors, mutual fund managers, other finance professionals, and even among students in experimental works). The more well-documented “systematic” biases are the diversification bias, the disposition bias (also called, the disposition effect) and overconfidence. These biases lead investors to make sub-optimal portfolio allocations and consequently, are responsible of asset mispricing. They are deeply presented with their consequences in finance, in the next sections.

Aside from these classical behavioral biases, other biases have been shown to explain market anomalies. First, Barberis et al. (1998) identify a conservatism bias, i.e. the tendency of investors to underweight new information relative to prior information. In the case of earnings announcements, the

conservatism bias means that investors do not sufficiently react and, as a consequence, the price increases not enough. The conservatism bias causes thus market underreaction. However, these authors show that the price increases too high after a series of good earnings announcements due to the representativeness bias⁷ (or the law of small numbers). Actually, this bias causes market overreaction because it leads investors to believe that there is some trend in prices. Second, Daniel et al. (1998) document that the overconfidence bias has consequences on asset prices. Actually, overconfident investors tend to overestimate the precision of their private information thus pushing the price up too high, far from its fundamental value. Investor confidence grows when the public information confirms the private information, a phenomenon called the self-attribution bias⁸. Further public information gradually pushes security prices back to its fundamental value. In sum, the self-attribution bias leads to short-term momentum in security prices and to a reversed momentum (or long-term reversals).

In this section, we review the literature on the three systematic behavioral biases, i.e. the diversification bias (Section 1.2.1), the disposition effect (Section 1.2.2) and overconfidence (Section 1.2.3) because they are the most often identified ones, both in retail investors and in institutional investors.

For each bias, we first give the definition and characteristics of the bias and list the countries and studies where it was identified. Then, we point out the main determinants of the bias. Specifically, we present the ones that are related to investors' sociodemographic and economic characteristics (e.g. gender, age and income), to their trading characteristics (e.g. the number of stocks in the portfolio and investment experience) and to investors' subjective attributes (e.g. risk tolerance). We deliberately choose to not focus on financial market variables (e.g. volatility, transaction costs) because our aim is to look at retail investors' characteristics that are used in the next chapters.

1.2.1 The diversification bias

Under Markowitz's portfolio theory (Markowitz, 1952, 1959), investors have to hold a large number of securities⁹ in order to eliminate idiosyncratic or specific risk. Indeed, each security included in a diversified portfolio represents a smaller fraction of the portfolio than if that portfolio was not diversified. Therefore, any increase or decrease of a stock value has a low impact on total portfolio value. This theory, also called the mean-variance portfolio theory (or Modern Portfolio Theory), assumes that investors are risk averse. So, if there are two portfolios with equal expected returns, investors are supposed to choose the one with the lowest volatility. Risk averse investors will accept to take on more risk, i.e. higher return volatility, only if higher risk is compensated by higher expected returns. Diversification benefits exist when it is possible to reduce portfolio volatility without reducing expected returns.

⁷Actually, the representativeness heuristic leads to another bias, that is the law of small numbers (or the representativeness bias). It means that a sample is judged representative of the population from which it was drawn, irrespective of the sample size. In other words, this bias illustrates the tendency to generalize from a small set of data.

⁸Investor confidence does not fall if both information contradict.

⁹According to Statman (1987), at least 30 stocks should be held by an investor.

However, the literature provides evidence of equity portfolio under-diversification among US retail investors (Lease et al., 1974) and households (Kelly, 1995 and Polkovnichenko, 2005). This lack of portfolio diversification is also observed in retirement and pension accounts (Benartzi, 2001, Benartzi and Thaler, 2001, Agnew et al., 2003 and Meulbroek, 2005). Actually, US retail investors hold portfolios with less than five stocks (Odean, 1999, Barber and Odean, 2000, Mitton and Vorkink, 2007, Kumar, 2007 and Goetzmann and Kumar, 2008). This bias was identified all over the world, such as in Europe (Belgium (Bellofatto et al., 2018), Germany (Dorn and Huberman, 2005), France (Broihanne et al., 2016), Finland (Grinblatt and Keloharju, 2009), Sweden (Calvet et al., 2007) and Switzerland (Hoechle et al., 2017)) and in Asia (China (Feng and Seasholes, 2008) and Turkey (Fuertes et al., 2014)). Portfolio under-diversification is risky but also costly. For example, Meulbroek (2005) finds that employees get lower expected returns from holding company stock than from holding a diversified and equally risky equity portfolio. Surprisingly, portfolio under-diversification impacts positively performance, specifically among high-turnover investors (Goetzmann and Kumar, 2008) and among investors with large stock portfolios (Ivković et al., 2008). Indeed, Goetzmann and Kumar (2008) show that high-turnover and under-diversified portfolios outperform high-turnover and less diversified portfolios. By analyzing the same US dataset, Ivković et al. (2008) show that, among households with large portfolios, concentrated portfolios (containing one or two stocks) outperform more diversified portfolios (containing three stocks or more). These studies argue that portfolios are under-diversified because investors may hold private information.

Different measures exist to evaluate the extent of portfolio diversification. The number of stocks in the portfolio, the normalized portfolio variance (i.e. the portfolio variance divided by the average variance of the stocks in the portfolio) and the Herfindhal-Hirschman Index or HHI (that is a concentration measure approximated by the sum of squared portfolio weights¹⁰) are the most commonly used measures (Dorn and Huberman, 2005, Kumar, 2007, Goetzmann and Kumar, 2008, Ivković et al., 2008, Fuertes et al., 2014¹¹, Broihanne et al., 2016, Merkle, 2017 and Bellofatto et al., 2018)¹².

The (under-) diversification bias takes different forms. First, retail investors are subject to the familiarity bias (Huberman, 2001), i.e. the preference for investing in the familiar which makes people feel more comfortable. Investing in the familiar may express either by the preference for locally headquartered firms near to the investor place of living or “the local bias” (Coval and Moskowitz, 1999, Bodnaruk, 2009 and Seasholes and Zhu, 2010), either by the preference for investing in domestic firms or “the home bias” (Cooper and Kaplanis, 1994, Strong and Xu, 2003 and Graham et al., 2009), or, by

¹⁰HHI is comprised between 0 and 1. The closer HHI to 1, the more the portfolio is concentrated, i.e. the lower the portfolio diversification level.

¹¹Fuertes et al. (2014) additionally compute the average of the number of different shares held in end-of quarter portfolios and, the *time-weighted* average of the number of different shares in the portfolio (on a daily basis) to measure retail investors' portfolio diversification.

¹²To measure the diversification effect of a trade, Hoechle et al. (2017) estimate the beta of a new stock relative to the equity portfolio of the client. Besides, they use a dummy variable coded 1 if the retail client purchases a new stock and 0 otherwise.

the preference for employer stocks (Benartzi, 2001, Poterba, 2003 and Lee et al., 2008).

Second, portfolio diversification is naive because people use a simple rule of thumb, the “ $1/n$ ” heuristic, to make their investment decisions. According to Benartzi and Thaler (2001), people divide naively their contributions across the n investment options offered in retirement savings plans. By using a survey, these authors ask the employees of the University of California to allocate their retirement contributions in each of the three following conditions:

- *Fund A is invested 100% in stocks and Fund B is invested 100% in bonds;*
- *Fund A is invested in stocks and Fund B is a “balanced fund” investing 50% in stocks and 50% in bonds;*
- *Fund A is the balanced fund and Fund B is invested 100% in bonds.*

Whatever the condition, people allocate 50% of their contributions to each fund. Therefore, people spread naively their contributions irrespective of the mix of options, i.e. of the risk of the retirement plan.

Last, the preference for positive skewness may drive portfolio allocations (Brunnermeier and Parker, 2005, Mitton and Vorkink, 2007 and Barberis and Huang, 2008). Actually, the propensity to gamble leads investors to invest disproportionately more in lottery-type stocks, i.e. stocks with low prices, high idiosyncratic volatility and high idiosyncratic skewness (Kumar, 2009). Moreover, the preference for skewness depends on market trends and is identified in bull markets, while it disappears in bear markets (Broihanne et al., 2016).

A variety of observable individual characteristics, or objective attributes, are correlated with portfolio diversification choices. Indeed, portfolio diversification level increases with age, income, wealth, education (Vissing-Jorgensen, 2003, Goetzmann and Kumar, 2008, Dorn and Sengmueller, 2009, Anderson, 2013, Fuertes et al., 2014 and Merkle, 2017), specifically with IQ (Grinblatt et al., 2011). Married investors, however, display poor diversification levels in Finland (Grinblatt et al., 2011) and in Turkey (Fuertes et al., 2014), unlike in the US (Barber and Odean, 2001). Additionally, Goetzmann and Kumar (2008) find that sophisticated investors, i.e. those who trade options, engage in short-selling and have a greater investment experience, hold better diversified portfolios. As for professional categories, these authors show that investors belonging to the non-professional category (i.e. those who are blue-collar workers, sales and service workers, clerical workers, house-makers or students), hold the least diversified portfolios, while retired investors hold the most diversified portfolios. Fuertes et al. (2014) show that portfolio diversification is reduced among investors exercising a finance-related job, possibly due to overconfidence. As for demographic characteristics, these authors find that investors living in wealthier cities with higher GNPs hold better diversified portfolios. Examining financial holdings, Goetzmann and Kumar (2008) point out that investors holding mutual funds and foreign equities exhibit a higher propensity to diversify their stock portfolios.

Subjective attributes elicited through surveys/questionnaires also affect portfolio diversification.

Combining survey responses of German clients with their brokerage records, Dorn and Huberman (2005) point out that risk aversion is an important determinant of both portfolio diversification and turnover. Specifically, these authors find that investors who report being more risk tolerant hold less diversified portfolios and realize much more trades. They additionally find that investors who consider themselves knowledgeable on financial securities hold better diversified portfolios. Guiso and Jappelli (2009) also provide evidence that financial literacy is correlated with the degree of portfolio diversification. By constructing indicators of financial literacy based on survey responses, these authors show that poor financial literacy is responsible of the lack of diversification. Interestingly, Bellofatto et al. (2018) find that Belgian retail investors who report higher levels of financial literacy (gathering financial knowledge and experience) in the MiFID questionnaire hold more concentrated stock portfolios and achieve global diversification through investing in funds. Finally, Dimmock et al. (2016) show that ambiguity-averse investors hold highly under-diversified portfolios¹³.

1.2.2 The disposition bias

Identified by Shefrin and Statman (1985), the disposition effect is the tendency of investors to sell winners too early and to hold losers too long. For example, Seru et al. (2009) find that a median investor is 2.8 times more likely to sell a winning stock than a losing stock. The disposition effect is suboptimal because sold winners continue to outperform kept losers in subsequent months (Odean, 1998a) and, it generates poor investment performance (Seru et al., 2009).

A set of explanations of the disposition effect were proposed in the literature. The first explanation proposed by Shefrin and Statman (1985) is based on the assumptions of the Cumulative Prospect Theory or CPT (Kahneman and Tversky, 1979 and Tversky and Kahneman, 1992). Under CPT¹⁴, individuals frame their decisions in terms of gains and losses relative to a reference point and they are risk averse over gains and risk-seeker over losses. Then, if the price of a stock has risen since its purchase (or the reference price), the investor tends to sell this winning stock because he/she is risk averse; and if the price of the stock has dropped since its purchase, the investor tends to keep this losing stock because he/she is risk seeking. However, some studies show that CPT does not always explain the disposition effect (e.g. Meng and Weng (2018)¹⁵). Second, Shefrin and Statman (1985) argue that, due to mental accounting (Thaler, 1985), individuals tend to earmark their funds into different mental accounts and apply CPT decision rules to each account without considering possible interactions between accounts. When a stock is purchased, individuals open a new mental account (the reference point being the stock purchase price). A sale implies the closeness of the mental account. Decision makers, however, have difficulties to close mental account at a loss (Thaler and Johnson, 1990).

¹³Being ambiguity averse implies a preference for events, for which the probabilities associated with the future outcomes are known, over events, for which the probabilities of the future outcomes are unknown.

¹⁴CPT is an alternative to Expected Utility Theory (von Neumann and Morgenstern, 1944) .

¹⁵Meng and Weng (2018) explain that there is often no disposition effect if initial wealth is the reference point. Prospect theory explains the disposition effect when the reference point is the lagged expected final wealth.

Third, seeking pride and avoiding regret were proposed to explain the disposition effect (Shefrin and Statman, 1985, Barber and Odean, 1999 and Summers and Duxbury, 2012). Another explanation is based on the plain mean-reversion, namely investors might keep losers because they falsely believe that their prices would increase in the future (Odean, 1998a). Recently, Corneille et al. (2018) find experimentally that the belief in mean-reverting prices contributes to explain the disposition effect.

To measure the disposition effect at the individual level, Odean (1998a) compares the price of each stock held by investors to its average purchase price to determine whether it is a gain or a loss. If the stock is sold, it is considered to be a realized gain or loss. If the stock is not sold, it is a paper (unrealized) gain or loss. For each retail investor i , the number of realized gains (NRG_i), the number of paper gains (NPG_i), the number of realized losses (NRL_i) and the number of paper losses (NPL_i) are counted. Then, the Proportion of Gains Realized (PGR_i) and the Proportion of Losses Realized (PLR_i) of investor i are computed as follows:

$$PGR_i = \frac{NRG_i}{NRG_i + NPG_i} \quad (1.2.1)$$

$$PLR_i = \frac{NRL_i}{NRL_i + NPL_i} \quad (1.2.2)$$

The disposition effect for investor i (DE_i) is the difference between (1.2.1) and (1.2.2):

$$DE_i = PGR_i - PLR_i \quad (1.2.3)$$

This methodology is the most commonly employed in the literature (Dhar and Zhu, 2006, Boolell-Gunesh et al., 2009, Rau, 2015, Lu et al., 2016 and Corneille et al., 2018)¹⁶.

Interestingly, the disposition effect is shown to be much lower in December than in the rest of the year due to tax considerations (Odean, 1998a, Grinblatt and Keloharju, 2001b and Dhar and Zhu, 2006). Indeed, investors sell a greater proportion of losers to take advantage of tax benefits, and consequently, exhibit a lower disposition effect. In France, Boolell-Gunesh et al. (2009) find evidence that holding tax free accounts does not impact the disposition effect. They especially study PEA accounts, which capital gains are exonerated from taxes after 5 years from the account opening date. As for market conditions, Muhl and Talpsepp (2018) find evidence that the disposition effect is present in both bull and bear markets but is particularly stronger during bear markets.

The disposition effect was identified in retail investors over different countries, such as Australia

¹⁶ Alternative measures were employed in the literature. Weber and Camerer (1998) compute the difference between the number of realized gains and the number of realized losses relative to the number of total trades. Dhar and Zhu (2006) measure the disposition effect by computing the difference between the number of realized gains relative to the number of realized losses and the number of paper gains relative to the number of paper losses. In addition to the methodology of Odean (1998a), Talpsepp (2010) employs a survival analysis, that is the Cox proportional hazard model with time-varying covariates. This method was also used by Vaarmets et al. (2018). Grinblatt et al. (2012) and Hoechle et al. (2017) use logit regressions where the dependent variable is coded 1 if the investor sells a stock for which the purchase price is known and 0 if the stock is not sold the same day and for which the purchase price is known.

(Frino et al., 2015), Belgium (Bellofatto et al., 2018), China (Chen et al., 2007), Estonia (Talpsepp, 2010), Finland (Grinblatt and Keloharju, 2001b), France (Boolell-Gunesh et al., 2009, 2012), Germany (Weber and Welfens, 2007), Israel (Shapira and Venezia, 2001), Korea (Choe and Eom, 2009) and Taiwan (Goo et al., 2010).

The presence of the disposition effect was also identified experimentally by Weber and Camerer (1998). In their experiment, subjects buy and sell shares in six risky assets which prices vary over time. Subjects sell winners and keep losers exhibiting thus the disposition effect. By using a computer program simulating the stock market, Da Costa et al. (2013) show that both experienced investors and inexperienced ones, i.e. undergraduate students, exhibit the disposition effect although the more experienced investors¹⁷ are less subject to this bias. Their findings are in line with the ones of Shapira and Venezia (2001) who empirically show that although both retail and professional investors are subject to the disposition effect, the size of the effect is stronger in retail investors. The disposition effect is therefore exhibited by a variety of studies, irrespective of the familiarity or experience of subjects with financial markets. Interestingly, Chang et al. (2016) distinguish non-delegated assets (e.g. stocks) from delegated assets (e.g. funds) and provide evidence that non-delegated assets display a disposition effect while delegated assets display a reverse disposition effect. The explanation relies on cognitive dissonance. Indeed, in the case of delegated assets, the decision-making is delegated to an outside agent, leading investors to blame him/her in case of poor performance without considering investors' own mistakes.

Looking at the determinants of the disposition effect, Rau (2014) analyzes whether gender differences matter in the disposition effect in an experiment based on Weber and Camerer (1998). He finds that the disposition effect is higher in women than in men investors. This result is confirmed by Frino et al. (2015) who study retail investors' trading in Australia and additionally find that ethnic background, specifically investors of Chinese background, and older investors exhibit a higher disposition effect. Besides, Rau (2015) shows that two-person teams display higher disposition effects than those who trade alone. This finding is in line with the one of Cici (2012) who empirically shows that US equity mutual funds managed by teams exhibit a higher disposition effect. Rau (2015) points out that investor teams reporting high levels of regret in the post-experimental questionnaire exhibit greater disposition effects than individuals. Decision-dependent emotions then explain differences in the degree of the disposition effect, as already shown by Summers and Duxbury (2012). In a similar vein, Heimer (2016) shows that the access of retail traders to a social trading web platform almost doubles the magnitude of the disposition effect. Therefore, social interaction drives the disposition effect size. Recently, Pelster and Hofmann (2018) find that leader traders, i.e. investment advisers, are more susceptible to exhibit the disposition effect than investors whose trading behavior is not followed

¹⁷Experience corresponds to the number of years the investor has been investing in stocks. Specifically, these authors use a dummy variable coded 1 for more than 5 years of experience.

by other traders. These authors argue that the fear of reputational loss when leaders are observed by their peers reinforces the disposition bias.

The disposition effect is attenuated in some investors, whose characteristics are described hereafter. For example, Dhar and Zhu (2006) investigate the presence of the disposition effect in US retail investors. They find that the disposition effect is smaller among more sophisticated investors, i.e. those with high income and in professional occupations. Besides, trading experience reduces the disposition effect but does not eliminate it. In France, Boolell-Gunesh et al. (2012) use proxies for investor sophistication, i.e. trading foreign assets, warrants and bonds as well as trading on both tax-free and traditional accounts, and show that the level of the disposition effect is lower among sophisticated investors. They additionally report that, at the individual level, the disposition effect declines over time due to investor sophistication. Interestingly, Feng and Seasholes (2005) find that the combination of sophistication and trading experience eliminates the reluctance to realize losses and the propensity to realize gains by 37%¹⁸. Goo et al. (2010) and Vaarmets et al. (2018) show that investors with higher levels of education are less affected by the disposition effect in Taiwan and Estonia, respectively. Specifically, Vaarmets et al. (2018) find that mathematical abilities are associated with lower levels of the disposition effect. In Belgium, Bellofatto et al. (2018) find that higher levels of financial literacy are associated with a lower disposition effect. This confirms that the disposition effect weakens as investors gain experience.

1.2.3 Overconfidence

Odean (1999) shows that retail investors trade excessively in financial markets which results in poor performance because, on average, the securities they buy underperform the securities they sell. According to Odean (1998b), investors are overconfident, i.e. they overestimate the precision of their information signals and of their posterior beliefs, and therefore, trade excessively.

As a consequence, portfolio turnover is often used as a measure of investor overconfidence (Barber and Odean, 2001, Goetzmann and Kumar, 2008, Kumar, 2009 and Tekçe and Yilmaz, 2015). Glaser and Weber (2009) find evidence that, after high portfolio returns, investors tend to buy high risk stocks and to reduce the number of stocks in their portfolio due to their overconfidence.

Overconfidence has been identified among a variety of professionals, such as CEO (Malmendier and Tate, 2005, 2008), fund managers (Menkhoff et al., 2006), stock market forecasters (Deaves et al., 2010) and mutual fund investors (Bailey et al., 2011), as well as across different countries such as in the UK (Merkle, 2017), France (Broihanne et al., 2014), Germany (Glaser and Weber, 2007), China (Chen et al., 2007) and Turkey (Tekçe and Yilmaz, 2015).

By analyzing US investors switching from phone-based to online trading during the 1990s, Barber

¹⁸They use four proxies for investor sophistication that are the number of trading rights, an indicator of initial diversification (i.e. the number of stocks in investor's portfolio), gender (i.e. male investors) and age (i.e. older investors).

and Odean (2002) show that online investors trade excessively and perform worse because they become more overconfident on their ability to profit from online trading. These authors explain that the self-attribution bias, the illusion of knowledge and the illusion of control can explain why investors become more overconfident after going online. First, the self-attribution bias means that people tend to attribute their successes to their own abilities and their failures to their lack of luck or to the actions of the others (Miller and Ross, 1975) engendering thus overconfidence (Gervais and Odean, 2001). Second, going online offers the opportunity to access large quantities of investment data thus fostering greater overconfidence (i.e. illusion of knowledge). Finally, online investors behave as if their personal involvement could influence the realization of chance events, even so random (i.e. illusion of control, see Langer and Roth (1975)).

Different facets of overconfidence are pointed out in the literature among which we overview miscalibration, the “better than average effect” (BTA), illusion of control and unrealistic optimism. First, overconfidence can manifest itself by *miscalibration*, i.e. individuals overestimate the precision of their knowledge. A calibration test usually consists in asking individuals to state a 90% confidence interval for the height of the Eiffel Tower or the highest depth of the Atlantic Ocean, for example. Individuals, however, choose too tight intervals (Lichtenstein et al., 1982), e.g. the percentage of true values that are outside the interval is greater than 10%. The calibration of probability judgments is also considered. Indeed, individuals are asked to answer questions, then are invited to state the frequency of the correctness of their answers. However, that stated frequency is usually lower than the real proportion (Lichtenstein et al., 1982). Deaves et al. (2010) find experimentally that calibration-based overconfidence increases trading activity. Second, another facet of overconfidence is the “better than average” (or BTA hereafter) effect. The BTA manifests when individuals perceive themselves above average. Individuals overestimate their skills and abilities relative to others, e.g. considering themselves more skillful than the average driver (Svenson, 1981), or entrepreneurs’ judging their success better than the others (Cooper et al., 1988). Dorn and Huberman (2005), Glaser and Weber (2007) and Deaves et al. (2008) find that trading activity is higher among investors who think they are above average. Third, overconfidence also manifests by the illusion of control (Langer, 1975 and Langer and Roth, 1975), i.e. individuals overestimate the control they may have over events, even those that occur randomly, e.g. lottery or coin tosses. Individuals tend to attribute success to their behavior or, equivalently, are subject to the self-attribution bias (Miller and Ross, 1975). Finally, unrealistic optimism (Weinstein, 1980) is also linked to overconfidence in individuals’ judgment. Specifically, individuals believe that they are more likely to experience positive events (e.g. winning a lottery) and are less likely to experience negative events (e.g. developing cancer) than others.

In the academic literature, the determinants of overconfidence are often identified by looking at trading activity as excessive trading is explained by overconfidence (Odean, 1999, Barber and Odean, 1999, 2000, 2001 and 2002, Graham et al., 2009 and Daniel and Hirshleifer, 2015).

As pointed out by Barber and Odean (2001), trading activity is higher in men than in women. Specifically, men trade 45% more often than women and get worse performance. These authors consider gender as a natural proxy for overconfidence. Interestingly, Bengtsson et al. (2005) use exam data from Stockholm University to show that male students are more inclined to aim a greater grade than their female counterparts. Barber and Odean (2001) also point out that single men trade much more and get poorer performance than single women. Men investor overconfidence has also been confirmed recently by Tekçe and Yılmaz (2015). These authors additionally show that overconfidence is higher among younger investors, those with a low portfolio value and investors with low income and living in the less economically developed regions. By using data from UBS/Gallup investor survey, Graham et al. (2009) study whether US investor competence impacts trading frequency. These authors argue that “people are more willing to bet on their own judgments when they feel skillful or knowledgeable”. This competence effect is measured through the following question “How comfortable do you feel about your ability to understand investment products, alternatives, and opportunities?”, responses being ranked from 1 (very uncomfortable) to 5 (very comfortable). These authors identify demographics related to investor competence. They find that male investors and investors with larger portfolios or high education level are more prone to consider themselves as competent. Then, the authors show that investor competence is positively associated with trading frequency. Grinblatt and Keloharju (2009) analyze overconfidence together with sensation seeking to explain excessive trading of Finnish retail investors. They find that overconfidence and sensation seeking increase trading frequency. Dorn and Huberman (2005) find that investors reporting to be more risk tolerant in the survey trade more aggressively. They additionally point out that investors who consider themselves more knowledgeable than the average churn their portfolios more. Likewise, Bellofatto et al. (2018) provide evidence that trading activity is higher among Belgian retail investors who report higher levels of financial literacy, i.e. higher financial knowledge and experience.

Aside from being the most often quoted in the literature, the diversification bias, the disposition effect and overconfidence have been studied together in some works. In the US, Goetzmann and Kumar (2008) show that investor overconfidence is correlated with their portfolio diversification. They find that overconfident investors hold less diversified portfolios. In Sweden, Calvet et al. (2009) find evidence that financial wealth, education and household size weaken under-diversification and the disposition effect. Analyzing a data from a large Swiss retail bank, Hoechle et al. (2017) examine whether financial advice help to overcome behavioral biases. They find that portfolios are better diversified and the disposition effect is lower among advised retail clients. In the UK, Merkle (2017) also finds that overconfident investors tend to hold less diversified portfolios. In Belgium, Bellofatto et al. (2018) show that retail investors who report higher levels of financial literacy, i.e. higher level of financial knowledge and experience, in the MiFID questionnaire, have a high trading activity, are

less affected by the disposition effect, hold concentrated stock portfolios and achieve diversification by investing in funds.

In sum, these behavioral biases are well-identified across many countries and among a variety of samples. Some determinants are common to a couple of biases, such as gender, age and income. Nevertheless, the impact of subjective attributes is seldom documented in the literature, such as risk tolerance, loss aversion and financial literacy. Elicited through surveys, these data are shown to explain actual trading behavior (Dimmock and Kouwenberg, 2010, Hoffmann et al., 2015 and Bianchi, 2018). The MiFID questionnaire might be helpful to identify *ex ante* which investors are the most likely to exhibit one or some behavioral biases. In our study, MiFID questionnaire answers offer the opportunity to gather rich information on the bank clients' characteristics. Moreover, the mandatory data collection under the European regulation enables to focus on a significant number of retail clients.

In Section 1.3, we provide further information on MiFID and on the MiFID questionnaire. We additionally present the MiFID-based studies for illustrative purposes.

1.3 MiFID

Implemented in November 2007, MiFID I (2004/39/EC) is a European directive grouping together 31 member states of the European Economic area (28 European member states and 3 other states: Iceland, Norway and Liechtenstein). This directive replaces the Investment Services Directive (ISD) which was adopted in 1993. MiFID I aims to improve the competitiveness of European financial markets and to ensure a harmonized protection for investors depending on their level of financial knowledge. To ensure this protection, MiFID I requires investment service providers to collect detailed information on their clients through a questionnaire, called *the MiFID questionnaire*, to offer advice and financial products perfectly suited to their situation.

From January 2018, MiFID II (2014/65/UE) comes into force replacing thus MiFID I, which we consider in this study. The purpose of MiFID II is to strengthen the transparency and the efficiency of financial markets, but also to strengthen the protection of investors.

The MiFID questionnaire is mandatory to the European member states only, while it is not in the US. More importantly, the directive does not impose a standard MiFID questionnaire. Each bank is therefore free to design its own questionnaire. However, the information that banks are required to gather must deal with the client's financial situation, investment objectives as well as knowledge and experience of financial markets¹⁹.

Table 1.3.1 presents MiFID prescriptions items and their content²⁰.

¹⁹See the fourth and fifth paragraphs of Article 19 of Directive 2004/39/CE of 30 April 2004 on markets in financial instruments.

²⁰See the European Commission, Article 35-1, Article 35-4, Article 37-1 of the Directive 2006/73/CE of 10 August 2006 implementing Directive 2004/39/EC of the European Parliament and of the Council. MiFID prescriptions are also reported by de Palma and Picard (2011), Linciano and Soccorso (2012) and Mazzoli and Marinelli (2014).

Table 1.3.1 – MiFID prescriptions

Items	Item content
Financial situation	· source and extent of regular income · assets (including liquid assets, investments and real property) · regular financial commitments
Investment goals	· investment period · purpose of the investment · preferences regarding risk taking and risk profile
Knowledge and experience of financial markets	· types of service, transaction and financial instrument with which the client is familiar · the nature, volume and frequency of the client's transactions in financial instruments and the period over which they have been carried out · the level of education of the client · the profession of the client

To provide suitable recommendations, the bank has to collect information on the client's financial situation by asking to him/her questions dealing with his/her regular income, assets and regular financial commitments. The diagnosis of the client's finances has to be followed by a qualitative information regarding the source of his/her regular income. Therefore, the client's financial capacity is assessed by considering his/her current income, available funds, i.e. liquid and illiquid assets, and financial needs. Moreover, the bank has to consider the client's investment objectives, which refer to three distinct notions, in order to offer the best suited financial products to the client's situation. First, he has to identify the desired investment period. Then, he has to collect the purpose of the investment because it reflects the client's future financial planning and, as a consequence, has an impact on his/her investment decisions. Finally, he has to determine the client's preferences regarding risk taking and risk profile. These preferences refer to the key concept of risk aversion, which is widely studied in both theoretical (Kimball, 1993 and Holt and Laury, 2002) and empirical (Kapteyn and Teppa, 2011, Hoffmann et al., 2015 and Guiso et al., 2018) studies. The bank has also to collect financial knowledge and experience, which are key measures of the client's familiarity with financial markets. Financial knowledge is based on the understanding of financial product characteristics, while experience refers to the client's transactions in financial products. The level of education and the profession of the client are socioeconomic characteristics additionally included in the questionnaire.

Although the directive stipulates the information that investment service providers are required to collect, banks are free to organize their own questionnaire. As a result, the MiFID questionnaires of different banks are not comparable. Questionnaire length may be also different from a bank to another one. Due to the lack of a benchmark questionnaire, the profile of an investor may therefore be different when the same investor is assessed by other financial institutions. In Italy, Marinelli and Mazzoli (2011) examine the content of 14 MiFID questionnaires and show that there are divergences

and similarities across the questionnaires. By using a sample of 100 investors who completed three different questionnaires, these authors show that profiles obtained by the same investor differ across the questionnaires. In France, de Palma and Picard (2011) have realized a diagnosis of 14 MiFID questionnaires provided by 10 financial intermediaries²¹. Produced at the initiative of the Financial Markets Regulator (AMF²²), their study provides qualitative and quantitative analyzes corresponding to *ex ante* and *ex post* analyses of the questionnaires. They investigate whether the questionnaires meet the objectives of the directive and whether corrective measures are necessary. The authors formulate observations and recommendations for designing the MiFID questionnaire. They point out the use of a quantitative measurement of risk aversion to ensure that suitable financial products are sold to clients. To accurately evaluate clients' risk-taking behavior, the quantitative measure must additionally consider loss aversion and probability distortion, i.e. the tendency of clients to overestimate the probability of rare events in their decision-making. To categorize clients by risk profile, some financial institutions establish a scoring rule. According to the authors, the questionnaire should also consider the actual economic situation which may modify the client's risk profile. A corrective measure would be to track clients over time and recalibrate their scoring rules. The authors recommend an objective evaluation rather than a subjective one in order to measure investors' financial experience. They advise to place each question in a specific section or context in order to get relevant information.

As a last remark, we note that, in the other European countries, the MiFID questionnaire distinguishes the *suitability* test (noted S-test) and the *appropriateness* test (noted A-test). The S-test is compulsory and administered to clients before providing any financial advice, while the A-test interferes before providing execution and transmission orders on complex financial instruments. The A-test is completed upon clients' request after the S-test. In other words, the S-test aims to understand the type of investments better suited to investors, whereas the A-test assesses investors' financial knowledge and experience in order to protect those who are not aware of the risk involved by complex financial instruments. Mazzoli and Marinelli (2014) and Bellofatto et al. (2018) give further details on these two tests by focusing on the MiFID questionnaires in Italy and Belgium, respectively. In France, all questions are asked in the same questionnaire without distinguishing the S-test from the A-test. Actually, the items *Financial situation* and *Investment goals* refer to the S-test while the item *Knowledge and experience of financial markets* refers to the A-test. Furthermore, the French MiFID questionnaires may also include questions satisfying anti-money laundering standards. This leads to disparities in the questionnaire contents, and thereby in retail clients' risk profile.

²¹The anonymity of banks must be preserved as the AMF may apply a sanction whether banks do not respect regulatory requirements.

²²AMF (*Autorité des Marchés Financiers* in French) is the French stock market regulator headquartered in Paris.

1.4 MiFID questionnaire analysis

In our study, we have the opportunity to analyze the MiFID questionnaire answers (labeled *Dataset 1*) of more than 90,000 retail clients of a large European retail bank together with their banking records (labeled *Dataset 2*) as of the 07/31/2015. The combination of declared data (which might be subjective) and recorded data (which are objectively observable) enables to contribute to the literature on retail investors' behavior but also to the European regulation regarding the informativeness of the MiFID questionnaire. The MiFID questionnaire of the bank was addressed to retail clients between 2007 and 2015. It satisfies the prescriptions of the directive, namely the three compulsory items regarding financial situation, investment objectives as well as knowledge and experience of financial markets but also includes questions regarding anti-money-laundering standards. The MiFID questionnaire answers are available for 100,590 retail clients. As for banking records, we have information on retail clients' socio-demographics, financial asset holdings and portfolio value as of the 07/31/2015. Banking records are available for 98,047 retail clients (out of 100,590, i.e. 97.47%).

The mandatory data collection through the MiFID questionnaire enables us to focus on a significant sample size. Our results are then exempt of any selection bias. Furthermore, our sample size is higher than the other MiFID-based studies (Mazzoli and Marinelli, 2014, D'Hondt and Roger, 2017 and Bellofatto et al., 2018). Our results give useful insights for twofold reasons. First, contrary to previous studies that use data coming from brokerage house (e.g. Barber and Odean, 2001, Goetzmann and Kumar, 2008 and Hoffmann et al., 2013, 2015), we do not only focus on retail investors. Our study focuses on all retail clients, some of them may only have a current account within the bank and do not participate in financial markets. Therefore, the study of these two datasets allows us to draw a representative picture of the French population. Second, retail clients are expected to give relevant answers to get appropriate advice from their financial adviser. As this is not the major concern of survey data used by prior behavioral finance studies (Dorn and Huberman, 2005 and Hoffmann et al., 2015), our study ensures a high data reliability.

In this section, we especially focus on the MiFID questionnaire answers. Section 1.4.1 describes the MiFID questionnaire holistically while carrying out a critical review and giving some recommendations in order to improve it. Section 1.4.2 analyzes more deeply the questionnaire by focusing on each question. We also pay attention to the framing effect, i.e. the way the questions and the proposals are presented, as it might sway retail clients' answers (Bruine de Bruin, 2011).

1.4.1 Questionnaire general presentation

The MiFID questionnaire of the retail bank has been administered a maximum of three times to 100,590 retail clients between 2007 and 2015. The MiFID questionnaire corresponds to MiFID I as the sample period begins in 2007, which is the date of the first implementation of this directive. About 70% of retail

clients declare that the bank under consideration in our study is their principle bank, i.e. they held and use a current account within this bank, which is also important for data reliability. Retail clients answered the questionnaire in the presence of a financial adviser and not online. According to Duffy et al. (2005), respondent fatigue leads to noticeable consequences for online surveys. Specifically, these authors indicate that the absence of an interviewer does not prompt respondents to answer questions. They note that respondents may click down or report answers less thought. In our study, retail clients may more likely to give reliable answers because they expect to get suited advice from their financial adviser. The questionnaire of the bank was not modified over the 2007-2015 period, which overlays the financial crisis. Thus, for example, the questionnaire administered in 2008 was once again used in 2015.

As indicated previously, the MiFID questionnaire was administered a maximum of three times to 100,590 retail clients between 2007 and 2015. Consequently, we distinguish three categories of retail clients, labeled Q1, Q2 and Q3, depending on the number of times they answered the questionnaire. Specifically, the questionnaire was completed once by 64,472 retail clients (denoted Q1 henceforth), twice by 23,416 retail clients (denoted Q2 henceforth) and thrice by 12,702 retail clients (denoted Q3 henceforth) over the 2007-2015 period.

Table 1.4.1 reports the number of retail clients depending on the year they have answered the (last) questionnaire (for those having answered it at least twice). This table only considers retail clients for which we have information in the two datasets and for which we report descriptive statistics in Section 1.6. Around three quarters of retail clients have answered the questionnaire between 2012 and 2015. Many retail clients have completed the questionnaire out of the financial crisis period leading thus less variability in answers. It would have been preferable that the bank adjusts the questionnaire content by considering the economic context as suggested by de Palma and Picard (2011) as retail clients' risk profile may be different due to current economic conditions.

Table 1.4.1 – Retail clients’ number depending on the questionnaire administration year

Retail client categories		Questionnaire administration year									Total
		2007	2008	2009	2010	2011	2012	2013	2014	2015	
Q1	N	556	3,019	3,544	4,79	5,686	6,968	8,162	8,889	6,843	48,457
	%	0.68	3.70	4.34	5.86	6.96	8.53	9.99	10.88	8.38	59.32
Q2	N	1	82	331	890	1,612	2,425	3,966	6,12	5,577	21,004
	%	0.00	0.10	0.41	1.09	1.97	2.97	4.85	7.49	6.83	25.71
Q3	N	0	2	23	162	338	796	1,695	3,627	5,599	12,242
	%	0.00	0.00	0.03	0.20	0.41	0.97	2.07	4.44	6.85	14.97
Total	N	557	3,103	3,898	5,842	7,636	10,189	13,823	18,636	18,019	81,703
	%	0.68	3.80	4.78	7.15	9.34	12.47	16.91	22.81	22.06	100.00

Table 1.4.1 reports the number (N) and the corresponding percentage (%) of retail clients having answered the last MiFID questionnaire (Q1 is the first questionnaire and for those who completed at least twice, i.e. Q2 and Q3 are the second and third questionnaires) between 2007 and 2015.

The purpose of the questionnaire is to collect detailed information on retail clients to provide the most suitable advice and financial products according to their situation and risk profile. However, there are retail clients who did not answer all questions despite of the presence of a financial adviser for questionnaire administration. In this section, we report the number of unreported answers which vary not only from one item (or question) to another one but also from one questionnaire to another one. These missing data may be due to ignorance or to the discretion of retail clients.

The MiFID questionnaire has five pages including several questions, which are organized into six sections. Each question brings additional information about retail clients. Survey design has been documented by many studies like Dillman et al. (2008) and Bruine de Bruin (2011). A slight variation in question formulation, choice sets and presentation order may change answers given by respondents (Converse and Presser, 1986 and Schwarz, 1996, 1999). For example, people may think about “prices in general” when making decisions on consumption and about “inflation” when making investment decisions (Bruine de Bruin, 2011). When people face several options, or choices, they may have a high tendency to select the first proposal(s) to answer faster questions due to the fatigue effect. Most survey researchers aim to administer clear questions to get consistent answers and thus avoid any misinterpretations. However, the huge questionnaire length may lead retail clients to pay less attention to the last questions of the questionnaire. Fatigue effect should also be considered. Therefore, the probability of getting high data reliability may become lower with questionnaire length due to the fatigue effect (Backor et al., 2007). Peytchev and Peytcheva (2017) find that a split questionnaire design yields lower measurement error related to questionnaire length. Besides, the number of unreported answers may increase with questionnaire length. Accordingly, we suggest reducing the length of the questionnaire. Moreover, several studies show that items placement influences individuals’ answers.

Indeed, these studies show that, by placing an item later in the questionnaire compared to the same question placed earlier, the number of missing records increases, the likelihood to give identical answers is higher and the answers are less detailed (Kraut et al., 1975 and Herzog and Bachman, 1981).

1.4.2 Questionnaire diagnostic

The questionnaire is composed of six sections dealing with socio-demographics, income, patrimony, bank loans, savings capacity and investment goals, respectively. The investment goal section includes four subsections dealing with the clients' main investment goals, risk tolerance, financial experience and attitudes towards losses during a hypothetical downturn, respectively. The full questionnaire is available in the Appendix (in French).

We do not analyze all questions in our work. We only pay attention to questions satisfying MiFID requirements (see Table 1.3.1). We classify the relevant questions into the three compulsory items. In addition, we create the item labeled *Individual characteristics* to consider sociodemographic indicators, such as gender, age and marital status²³, which are shown to impact investment decisions (Barber and Odean, 2001, Ackert et al., 2002 and Bertocchi et al., 2011).

In this subsection, we analyze the MiFID questionnaire answers of retail clients regarding their individual characteristics (Section 1.4.2.1), financial situation (Section 1.4.2.2), investment objectives (Section 1.4.2.3) and, knowledge and experience of financial markets (Section 1.4.2.4).

1.4.2.1 Individual characteristics

When they are included in any questionnaire or survey, questions dealing with individual characteristics are generally placed at its beginning regardless of the field study, such as marketing, sociology or medicine. These questions are easy and fast to be answered because they focus on general information demanding no reflection, such as gender, age or marital status.

In the questionnaire, the first question deals with gender and contains three proposals: miss, woman and man. Retail clients are then asked to report their date of birth. Family situation is analyzed through two questions dealing with the marital status and the number of children, respectively. For the marital status, retail clients must check one of the following marital statuses: married, divorced, single, widowed, married life or separated. We notice that the bank offers a wide range of proposals, while it could just have considered three statuses: single, married and divorced. Marital status may have different consequences on individual's patrimony over the course of the lifetime. The bank also asks retail clients to report the number of children. Finally, retail clients must check whether the questionnaire concerns only themselves or their family.

Although the questionnaire overlays the main individual characteristics, it would have been preferable to also include questions related to retail clients' education level and profession, which are a part

²³Similarly, de Palma and Picard (2011) introduce the item *Personal characteristics* for studying such indicators.

of the information on the knowledge and experience of the financial markets. Actually, retail clients' profession is available in banking records (Section 1.5.1), while the level of education is not.

1.4.2.2 Financial situation

In the questionnaire, the sections dealing with income, patrimony and bank loans enable to collect detailed information on retail clients' financial situation. Specifically, income refers to retail clients' net monthly income and to the source of their income. Patrimony refers to retail clients' main residence status and to the value of their real estate and financial assets. As for bank loans, they refer to retail clients' overall indebtedness. In all, we consider the financial situation item as a preliminary financial analysis because it aims to measure retail clients' financial capacity.

- Income

The questionnaire focuses on retail clients' net monthly income (expressed in euros). The bank demands retail clients to choose one proposal among six.

Table 1.4.2 presents the six proposals. Income brackets were arbitrarily determined by the bank. The bank may think that it is easier to get answers by asking retail clients to check one proposal than to report the exact value of their net monthly income. Indeed, the bank limits any detailed information for preserving discretion. This choice may enable to get further information from retail clients.

Table 1.4.2 – Net monthly income (in euros)

Net monthly incomes:		
☐ €0	☐ < €1,500	☐ €1,500 - €3,000
☐ €3,000 - €5,000	☐ €5,000 - €10,000	☐ More than €10,000

However, proposing a set of closed quantity categories may induce errors (Schwarz et al., 1985). Indeed, retail clients may choose a category by considering their disposable income for consuming and savings instead of their net monthly income. They may deduce from their net monthly income their monthly expenses like health insurance, bank loans and phone and/or internet subscriptions. Therefore, retail clients having a net monthly income of €3,100 may choose the bracket €1,500-€3,000 rather than €3,000-€5,000 if they only consider their monthly expenses. The opposite case can also be observed. Retail clients having a net monthly income close to the upper limit of an income bracket may feel a sense of pride by choosing an upper income bracket. For example, retail clients having a net monthly income of €2,900 may feel better or more comfortable by choosing the bracket €3,000-€5,000 rather than €1,500-€3,000 as they consider themselves wealthier. Consequently, they may give

a better representation of themselves than they are in reality²⁴.

Then, the bank asks retail clients to indicate their source of income by choosing at least one of the four proposals: salaried activity, non-salaried activity (i.e. liberal profession or individual entrepreneur), retirement and other source of income (e.g. rental income). The income source is a qualitative information completing the net monthly income. However, there is one downside to collect such an information. Retail clients may opt for both salaried activity and retirement, which may be considered as a status providing a salary even if this salary is not coming from a professional activity. Besides, they may have a high tendency to check only the last proposal, i.e. other source of income, for preserving discretion. Nonetheless, it would be preferable to ask retail clients to write their income source instead of demanding them to check one or more proposals for avoiding any misinterpretation.

- Patrimony

The patrimony section gives further information on wealth level as it focuses on real estate and financial assets owned by retail clients. First of all, the bank focuses on retail clients' real estate patrimony since it represents a long-term investment. Real estate represents about 61% of French households' gross patrimony in 2015, according to INSEE²⁵. We can assume that retail clients estimate easier and faster their real estate patrimony than their financial assets, for which they should think about the fraction of wealth allocated to each of them. The bank focuses on the main residence status then on the real estate patrimony estimation. Indeed, retail clients must check one of the three following main residence statuses: owner, lessee and free accommodated. This question is fast to answer as the distinction between the three statuses is easy.

Then, the bank focuses on the real estate patrimony estimation. Retail clients must check one of the four proposals for estimating the gross value of their real estate patrimony. Table 1.4.3 presents the corresponding proposals. These amount brackets were arbitrarily chosen by the bank. We notice that the bank considers retail clients who do not own real estate patrimony by including the proposal "€0". This question completes the previous one by providing a numerical value.

Table 1.4.3 – Real estate patrimony estimation

<i>How much do you estimate your real estate patrimony (gross value)?</i>	
☐ €0	☐ Less than €100,000
☐ €100,000 - €300,000	☐ More than €300,000

²⁴The net monthly income could have been collected with greater reliability by studying the flows on retail clients' bank account. However, this analysis is not conducted by most of banks because they mainly focus on important money transfers to guard against money laundering. Furthermore, the bank can extract these amounts, for example, through the analysis of loan documents.

²⁵The French national statistics bureau. The corresponding website is <https://www.insee.fr/fr/accueil>

As for the financial assets, the bank asks retail clients to estimate the value of each of the following financial assets: precautionary savings, home savings plan, equity portfolio, life insurance together with retirement plan, and other financial products. The presentation offered by the bank is reported in Table 1.4.4.

Table 1.4.4 – Financial asset estimations

	€0	< €5,000	< €15,000	< €50,000	More than €50,000
Precautionary savings	☐	☐	☐	☐	☐
Home savings plan	☐	☐	☐	☐	☐
Equity portfolio	☐	☐	☐	☐	☐
Life insurance/retirement plan	☐	☐	☐	☐	☐
Other	☐	☐	☐	☐	☐

The order in which the financial assets are presented is logical. Indeed, the bank first reports savings accounts (precautionary savings and home savings plan) before listing riskier ones (equity portfolio, life insurance/retirement plan and other financial products). All of them are presented on the same table. Retail clients may spend more time for filling this table as they must estimate the value of each financial asset. However, the choice of amount brackets made by the bank could have been different as a retail client investing €7,000 in home savings plan may check the third proposal, i.e. lower than €15,000, or the fourth one, i.e. lower than €50,000. In both cases, retail client's answer is correct, but the third proposal is the most appropriate one. Consequently, to provide an accurate estimation, there should be no intersection between amount brackets as it is the case for questions dealing with the net monthly income and real estate patrimony estimation. For this reason and because of financial asset holdings are also available in banking records, we consider henceforth banking records for the estimation of these amounts (see Section 1.5.2 and Section 1.6.2).

- Bank loans

The bank also focuses on the indebtedness situation of retail clients by asking them to estimate the total bank loan amounts still to be reimbursed.

Table 1.4.5 reports the question and the corresponding proposals. The bank proposes four bank loan amount brackets which were arbitrarily chosen. However, we note that the bank does not indicate whether the loan was made within the bank or within other banks. The bank loan amount is probably higher for home owners than for lessees. Real estate value may also influence the answer to this question. In fact, the higher this value, the higher the bank loan amount. Other variables, such as income and age, may influence the bank loan amount.

Table 1.4.5 – Bank loan amount estimation

<i>How much do you estimate the total bank loan amount remaining to reimburse?</i>	
☐ €0	☐ Less than €10,000
☐ €10,000 - €100,000	☐ More than €100,000

To sum up, we point out that the financial situation item is well-structured as it begins by investigating income level, which represents a basic question when we are interested in individuals' wealth. The next questions are more and more accurate and demand much more reflection as retail clients have to check the most suitable proposal. The questions overlay wealth components, namely income, real estate and financial asset values which all have a positive impact on wealth level as well as the bank loan amount which exercises the reverse impact. Nevertheless, the proposals were arbitrarily chosen by the bank. Besides, closed quantity categories may lead retail clients either to underestimate their wealth level for preserving discretion or to overestimate it for sounding like they are wealthier than they are towards their bank.

1.4.2.3 Investment goals

In the questionnaire, the section *Investment goals* groups four subsections dealing with the main investment goals, risk tolerance, financial experience and attitudes towards losses during a hypothetical downturn, respectively. The first criticism we can formulate is the classification of financial experience into the investment objective section, whilst it should be addressed separately according to MiFID prescriptions. For this reason, we discard financial experience analysis from the three others and classify it into the appropriate item *Knowledge and experience of financial market* (Section 1.4.2.4).

- Main investment goals

In the questionnaire, the bank asks retail clients to indicate their main investment goals.

Table 1.4.6 presents the question and the corresponding proposals. Retail clients are free to check one or multiple investment goals but also none of them.

Table 1.4.6 – Main investment goals

<i>What are your main investment goals?</i>
☐ Neither
☐ Building precautionary savings
☐ Preparing a real estate project
☐ Getting additional income
☐ Preparing your retirement
☐ Appreciating your capital
☐ Preparing your patrimony transmission

The first critic we formulate is the location of the first proposal “Neither” which indicates that retail clients have no investment goal. This proposal should have been placed at the end, i.e. after the other investment goals. By placing “Neither” at the beginning, retail clients may tend to check this proposal for completing faster the questionnaire. However, after reading the following proposals, retail clients may check additionally one or multiple investment goals contradicting thus their first choice “Neither”. The bank should not create any intersection between the proposal “Neither” and the others for avoiding any inconsistency. Consequently, we suggest placing “Neither” at the end. Furthermore, retail clients may also have other investment goals than those reported in the questionnaire. It would be preferable to add the proposal “Other investment goals” and to place it before “Neither”, for not restricting retail clients’ investment goals.

- Risk tolerance

The questionnaire also consists in assessing retail clients’ attitudes towards risk. Specifically, retail clients have to choose the assertion that best describes them regarding their risk tolerance.

Table 1.4.7 presents the question and the corresponding proposals.

Table 1.4.7 – Risk tolerance

<i>As a general rule, which assertion best describes you?</i>	modalities
☐ Accepting lower remuneration by taking no risk on the invested capital	0
☐ Seeking better remuneration by accepting a capital risk	1
☐ Seeking high performance by accepting a significant part of capital risk	2

Table 1.4.7 presents the question dealing with retail clients’ risk tolerance and its corresponding proposals in the first column. The second column reports modalities that we chose to attribute to proposals depending on risk tolerance level.

The bank evaluates the level of financial risk that any retail client is willing to bear by offering three proposals across which the risk tolerance level increases from the first to the last. Thus, proposals can be associated with numerical modalities coded from 0 to 2 increasing with the risk tolerance level. This data retreatment enables us to quantify risk tolerance measurement on an ordinal scale.

We first notice that the first two proposals focus on “remuneration” whereas the third one focuses on “performance”. To control retail clients’ understanding, the bank would have better defined performance under parentheses (i.e. remuneration per unit of risk) to distinguish it from “remuneration” although so such a distinction was expected.

If retail clients choose the first proposal, i.e. “accepting lower remuneration by taking no risk on the invested capital”, this means that they prefer getting an amount with certainty even if this amount is low. They are not willing to bear risk on their investment. So, they are not risk tolerant at all.

The second proposal, i.e. “seeking better remuneration by taking a capital risk”, implies that retail clients prefer getting a higher amount even if the risk associated with it is higher. Indeed, “capital risk” is perceived as riskier than “no risk”. In this case, retail clients are willing to bear a capital risk. They are, then, more risk tolerant as higher risk is compensated by higher remuneration.

As for the third proposal, i.e. “seeking high performance by accepting a significant part of capital risk”, the bank focuses on performance which refers to the risk-adjusted return, namely the return on investment considering the risk borne in getting that return. Retail clients opting for this proposal are then willing to bear an important capital risk, which is higher than that mentioned in the second proposal. Indeed, the bank uses the expression “significant part” to indicate that retail clients are confronted to a riskier situation. Risk tolerance level is then higher in the third proposal.

- Attitudes towards losses

The last question of the MiFID questionnaire is devoted to assessing retail clients’ attitudes towards losses during a hypothetical downturn. This question deals with the concept of loss aversion, which means that individuals are more sensitive to losses than to gains²⁶.

Table 1.4.8 reports the question and the proposals, which correspond to the behavior that retail clients would have had during a downturn.

Table 1.4.8 – Attitudes towards losses

<i>If in the coming months, your portfolio value would decrease by 15%, what would you do?</i>	modalities
☐ Selling all	1
☐ Selling a part of your portfolio	2
☐ Waiting until the portfolio value increases	3
☐ Taking advantage of lower prices to invest again	4

Table 1.4.8 presents the question dealing with retail clients’ attitudes towards losses and its corresponding proposals in the first column. The second column reports modalities that we choose to attribute to proposals.

²⁶To illustrate the asymmetry between gains and losses, Tversky and Kahneman (1992) develop the Cumulative Prospect Theory, which is the revised version of the Prospect Theory (Kahneman and Tversky, 1979). They estimate a loss aversion coefficient (noted λ) for quantifying the sensitivity to losses. They find that λ is equal to 2.25 meaning that individuals are 2.25 times more sensitive to losses than to gains.

In the question, we point out that the loss is represented as a percentage and not as an amount in euros. Consequently, retail clients feel the same loss whatever their wealth level. However, to check for retail clients' understanding, this question requires that the bank adds a supplementary explanation. Indeed, the bank would better add "i.e. a loss of €150 for an invested amount of €1,000" in parentheses. This would have helped retail clients to better represent a loss of 15% avoiding thus any misinterpretation. Moreover, the percentage chosen by the bank reflects the volatility of the stock market which was around 15-20% on an annual basis over the sample period²⁷.

Looking at the proposals, we point out that the selling rate decreases from the first proposal to the last one. In addition to selling (the first two proposals) and buying (the last proposal) behaviors, the bank considers the waiting behavior (the third proposal).

A closer examination of the proposals shows that the bank distinguishes retail clients who would sell their entire portfolio and those who would only sell a fraction of it. However, it would be interesting to ask clients to indicate this fraction to evaluate the degree of loss aversion. Besides, this indication would help retail clients to better distinguish these first two proposals. As for the third proposal, i.e. "Waiting until the portfolio value increases", the bank indicates that the portfolio value may increase and recover the initial level or more. Finally, the last proposal is formulated differently than the others. Indeed, the bank could have just indicated "Buying additional financial securities" instead of "Taking advantage of lower prices to invest again". However, the actual formulation makes the last proposal more attractive. By using the expression, "taking advantage", the bank draws retail clients' attention by showcasing this proposal. Besides, the bank may point out that a new investment could compensate a loss. The expression "invest again" may also be an incentive to buy more financial securities but does not consider retail clients' financial capacity. Therefore, a slight variation in formulating proposals may influence retail clients' answer.

1.4.2.4 Knowledge and experience of financial markets

In the questionnaire, a whole page is devoted to assessing retail clients' financial knowledge and experience. This part of the questionnaire only concentrates dichotomous questions, i.e. questions to which retail clients must check "yes" or "no". According to Bruine de Bruin and Fischhoff (2000), this kind of questions provides less information than multiple-choice questions. These authors suggest formulating fewer proposals when closed-ended questions deal with knowledge. Nonetheless, Cronbach (1941) indicates that knowledge acquisition is better tested with dichotomous questions.

Table 1.4.9 presents the questions dealing with both financial knowledge and experience.

²⁷In Belgium, Bellofatto et al. (2018) also study the MiFID questionnaire and report that the percentage of loss chosen by the online bank is 20%.

Table 1.4.9 – Financial experience and knowledge

Do you know that equity investment aims to seek high performance by accepting a significant capital risk?	☐ YES ☐ NO	
Have you ever bought or held?	☐ YES ☐ NO	
Do you know that bonds include capital risk in exchange for regular remuneration? (bond value may decrease if interest rates increase)	☐ YES ☐ NO	
Have you ever subscribed?	☐ YES ☐ NO	
Do you know that stocks listed in some markets (open market, Alternext) may incur significant price changes or present liquidity risks that might significantly increase your order execution delay?	☐ YES ☐ NO	
Do you know that there are different kinds of order for trades execution depending on the markets?	☐ YES ☐ NO	
	Do you know the risk associated with these products?	Have you ever subscribed?
	yes no	yes no
Warrants, treasury bonds and other assimilated products	☐ ☐	☐ ☐
Differed settlement service	☐ ☐	☐ ☐
Convertible bonds	☐ ☐	☐ ☐
Other financial investments (SCPI, FCPI, etc.)	☐ ☐	☐ ☐

Table 1.4.9 presents questions dealing with the knowledge and experience of financial markets.

We first point out the order in which the questions were presented to retail clients. The questionnaire starts with the classical financial products, i.e. stocks and bonds, then focuses on two questions dealing with the understanding of the financial operations and ends with unusual financial products, e.g. warrants or convertible bonds. The two questions on financial market functioning may be considered as transitory questions before focusing on unusual financial products, which are more complex. Turning to the way questions are built, we note that for each financial product, the bank asks two questions. The first question focuses on financial knowledge by assessing whether retail clients are aware of the risk associated with a financial product. The second question focuses on portfolio composition by investigating whether retail clients hold the financial product of the first question. Therefore, for each product, this set of questions enables to confront financial knowledge and experience. We overview hereafter all the questions.

The first two questions deal with stocks, which are the most popular financial products and widely documented in the finance literature (Barber and Odean, 2001, Andrei and Hasler, 2014, Liu, 2015,

Engelberg and Parsons, 2016 and Atmaz and Basak, 2018). We notice that the first question is very accurate. In fact, the bank could just as well have asked whether retail clients know the risk associated with stocks. Contrariwise, the bank gives more information on equity investment by indicating “high performance” and “significant capital risk”, which represent the two main characteristics of stocks. These details could help to improve retail clients’ financial knowledge. Therefore, the questionnaire has a kind of “unwished” pedagogical goal as retail clients can learn the risk/return trade-off. These details may also be considered as an incentive mechanism to answer “yes” to the question. Then, the bank uses a positive frame to make stocks more attractive (Bruine de Bruin, 2011). The second question investigates whether retail clients have ever hold stocks. This question completes the first one as it consists in testing their past (and declared) behavior towards this financial product.

In the same manner, the bank gives details about bonds by indicating in the first question the link between remuneration and risk associated with bonds. Additionally, it helps retail clients by reporting in parentheses that bonds value depends on interest rates. Again, there is a pedagogical effect helping retail clients. Like for stocks, we find a positive frame because this additional information encourages retail clients to check “yes”. Furthermore, the bank only documents the decrease of bonds value to encourage retail clients to take advantage of lower prices by investing in bonds.

In summary, questions dealing with the knowledge of stocks and bonds are very detailed and establish a link between the knowledge of risk/return trade-off and risk tolerance (i.e. whether they hold financial products). According to Lerner et al. (2000), using shorter everyday words rather than specific terms leads to ease the understanding of questions. Moreover, the order in which the bank treats these financial products is very important. Indeed, the bank first asks questions on stocks due to their greater media coverage. From the outset, retail clients may thus feel more confident and have a high tendency to answer “yes” to the question on the risk knowledge of stocks. This strategy may increase the probability of answering “yes” to the question dealing with the risk knowledge of bonds as the presentation of the two questions is similar. For these questions, the bank creates positive frame to communicate a positive change, i.e. the tendency to answer “yes”, from the neutral situation (Bruine de Bruin, 2011).

Aside from classical financial products, the bank introduces two questions to evaluate whether retail clients understand the operations of financial markets (see the fifth and sixth questions). These two questions may be difficult to understand as they deal with financial market specificities, such as liquidity risks and order execution delay. In other words, they also evaluate retail clients’ familiarity with financial markets.

Finally, the bank focuses on unusual or complex financial products, e.g. warrants or convertible bonds. We use the terminology “complex” because they are less known than stocks and bonds. Here, the presentation offered by the bank is different. There is no explanation associated with each of these complex financial products. We find no incentive effect to answer “yes” to the questions related to these

products. Consequently, retail clients may tend to answer faster these questions. The bank creates a negative frame as the presentation of the unusual financial products differs widely from the one of classical products making it insignificant in the sight of retail clients.

1.5 Banking record analysis

Banking records (Dataset 2) are extracted on the 07/31/2015 and available for 98,047 retail clients (out of 100,590) who completed at least once the MiFID questionnaire. Banking records contain a variety of information on socio-demographics, wealth and patrimony indicators, including financial asset holdings and portfolio value. Although part of this information is also available in Dataset 1, we pay a particular attention to the profession and trading activity of retail clients, as they also belong to the retail client profile regarding MiFID prescriptions.

This section describes the set of banking records. Section 1.5.1 presents socio-demographic indicators and Section 1.5.2 focuses on wealth and patrimony indicators.

1.5.1 Socio-demographic indicators

Aside from gender, age, marital status and the number of children²⁸, Dataset 2 gathers specific individual characteristics. First, we have information on the country of birth and the department of residence of retail clients. The country of birth is as a proxy for retail clients' familiarity with the country because it captures both the culture and language. The department of residence enables to study whether retail clients are living in or close to the biggest city of the country which reflects both high cost of life and international relations. Completing marital status, the matrimonial regime of retail clients is also available. The choice of a matrimonial regime is important as it dictates rules related to wealth allocation between spouses during the marriage but also, after its breakdown. In France, matrimonial regimes are divided into two categories: community and separation regimes. The community regime focuses on the notion of common goods, namely that all goods acquired before and/or after the marriage are common within spouses. Conversely, the separation regime excludes any joint-ownership between spouses. The bank classifies retail clients either to the community regime²⁹, either to the separation regime or none of them (e.g. single clients). In Europe, the community regime is fixed by default in some countries (e.g. France, Belgium, Italy and Luxembourg), while the separation regime is applied in other countries (e.g. Germany, England and Greece). In the US, the legal regime is different from one state to another state. According to Fremeaux and Leturcq (2013), individuals opting for the separation regime hold a higher education level than the others. Accordingly,

²⁸Marital status and the number of children are not further analyzed in our work since they are not shown to be key drivers of investment decisions. To accurately analyze household situation, we consider the choice of the matrimonial regime.

²⁹Actually, the bank reports three types of community regime, one of which is the default regime. However, we do not detail them as they are specific to the French system. As a consequence, they are treated together in this study.

the study of the matrimonial regime enables to capture retail clients' education level, which is a part of the information required by the directive. In addition, the profession of retail clients is available. The bank uses around forty socio-professional categories that we organize into four categories depending on the source of income (Section 1.6.2).

1.5.2 Wealth and patrimony indicators

Like Dataset 1, Dataset 2 provides information on the retail client's net monthly income, residence status and bank loan amounts still to be reimbursed. It provides further information on bank loan amounts by distinguishing consumer and real estate loans.

This set of information is richer than the one available in Dataset 1 and ensures data reliability since any investment in financial products is recorded into the bank's computer system. We also know whether retail clients hold a current account within the bank. This information enables to ensure that retail clients use their banking accounts daily. Dataset 2 offers the opportunity to study savings accounts and financial products held by retail clients. This joint-analysis enables to focus on retail clients' savings and risk-taking behaviors. We describe hereafter the savings accounts and financial products reported for all retail clients.

First, there are seven types of savings accounts: regulated savings accounts, standard savings accounts, taxed savings accounts, term deposits, popular savings accounts, home savings accounts, home savings plans and life insurance savings accounts. Some accounts can be grouped together due to their common characteristics. In that respect, we organize them into four accounts: regulated savings accounts, standard savings accounts, home savings accounts and life insurance savings accounts. Regulated savings accounts are free of French income tax and social charges contrary to standard savings accounts, which refer to taxed savings accounts, term deposits and popular savings plans. Home savings accounts and home savings plans are treated together as they are both interest-earning banking accounts granting access to a subsidized mortgage. As for life insurance savings accounts, they allow to set aside and invest money to prepare for retirement or for any long-term projects. For all these savings accounts, we only know whether or not they were held by retail clients. The amount invested in these accounts is not available.

Then, there are six risky financial products: stocks, mutual funds, warrants, bonds, unit-linked life insurance products and retirement plans³⁰. Therefore, we can focus both on single products (stocks, warrants and bonds) and on diversified ones (mutual funds, unit-linked life insurance and retirement plans). For each financial product, the ISIN code, type and quantity are available on the date of extraction of trading data (07/31/2015). We compute retail clients' portfolio value by multiplying reported quantities by prices, which were extracted from Eurofidai and Bloomberg. Only financial

³⁰Unit-linked life insurance and retirement plans are investment vehicles allowing retail clients to invest in a variety of asset classes, such as stocks, bonds or funds.

products, for which there is a valid ISIN code, are considered in the computation of portfolio value³¹.

1.6 Descriptive statistics

Analyzing the MiFID questionnaire answers together with banking records enables to draw an accurate picture of retail clients' profile. However, given though most of the information is identical in the two datasets, we choose to use one or another dataset depending on the nature of the information. Subjective attributes that are ensued from a self-assessment are extracted from Dataset 1, while objective attributes that are observable are extracted from Dataset 2. Actually, objective attributes, such as gender, age, location and financial asset holdings, are more accurately measured and easily observed (Dorn and Huberman, 2005). Dataset 2 ensures data reliability regarding objective attributes as they are recorded in the bank's computer system. This leads to preserve significant data on objective attributes, some of which might be unreported in Dataset 1 due to the fatigue effect or mistrust of completing the questionnaire. In Dataset 1, we only focus on questions requiring retail clients to make a self-assessment, especially regarding their investment goals, risk tolerance, attitudes towards losses and financial knowledge. These subjective attributes are often studied in the behavioral finance literature (De Giorgi, 2011, Bollen and Posavac, 2018, Bianchi, 2018 and Xie et al., 2018). Furthermore, for retail clients having answered at least twice the questionnaire, we only consider their answers to the last questionnaire which is extracted at the closest to and occurred before the date of banking data extraction, i.e. 07/31/2015, for the two following reasons. First, answers provided by clients are stable over time. Second, the number of unreported answers decreases from one questionnaire to another leading us to focus on a larger number of retail clients. Section 1.7 provides a detailed analysis on the number of unreported answers and on answers' stability.

From now, we only consider retail clients for which we have information in the two datasets³². Like in Bauer et al. (2009) and Hoffmann et al. (2013, 2015), minors, i.e. those aged under 18 years old, are excluded from the analysis. Furthermore, we do not consider deceased individuals and those who are no longer clients within the bank as of the 07/31/2015, leaving 81,703 retail clients for further investigation.

We define all variables (Tables 1.6.1 and 1.6.3) and report the corresponding descriptive statistics (Tables 1.6.2 and 1.6.4) for MiFID variables in Section 1.6.1 and for banking records in Section 1.6.2.

³¹Actually, prices are also available in Dataset 2 but to avoid any mistake in the estimation of portfolio value, they were extracted from Eurofidai and Bloomberg as of the 07/31/2015. For financial products traded in foreign currencies, exchange rates were used to convert prices into euros.

³²We recall that the MiFID questionnaire answers are available for 100,590 retail clients, 98,047 of whom we have information on their banking records.

1.6.1 MiFID variables

The use of survey/questionnaire allows to extract information on subjective attributes that have an impact on retail investors' portfolio and trading activities. In recent studies, subjective questions enabled for example to elicit risk tolerance (Hoffmann et al., 2015), loss aversion (Dimmock and Kouwenberg, 2010), ambiguity aversion (Bianchi and Tallon, 2018) and financial literacy (Bianchi, 2018) and to give useful insights into retail investors' behavioral characteristics. Kapteyn and Teppa (2011) show that a subjective measure of risk preference is more powerful for explaining portfolio choice than a theoretical measure (e.g. in Barsky et al. (1997)). Although these subjective attributes are well-documented in the literature, the impact of the combination of multiple attributes has seldom been conducted in prior behavioral finance studies. The use of the MiFID questionnaire gives the unique opportunity to explore such subjective attributes together. We especially interpret retail client's own self-assessed preferences regarding their investment goals, risk tolerance, attitudes towards losses and financial knowledge, i.e. financial literacy.

Looking first at investment goal choices (Table 1.6.2), we notice that more than a half of retail clients aims to build precautionary savings. Precautionary savings allow to cover unexpected costs and are considered as a primary goal from which individuals set more specific investment goals. Besides, they are like a safety mattress and represent the preferred investment type of French retail clients according to INSEE (2015). Then, about 21% of retail clients aim to appreciate their capital. About 15% of retail clients focus on their patrimony transmission, which is a family concern involving long-term inheritance. Preparing for a real estate project and for retirement are respectively chosen by about 12% of retail clients. These two investment goals represent specific long-term investments. Around 6% of retail clients aim to get additional income. Surprisingly, 22% of retail clients have no investment goal. Note that this proportion decreases with the number of times the questionnaire has been administered (see Table 1.7.1). This high proportion may be due to the location of the proposal "Neither" (Section 1.4.2.3, Table 1.4.6). Indeed, retail clients may tend to select this first proposal for answering faster the questionnaire. However, clients may additionally check other investment goals after reading the following proposals. To avoid any inconsistent answers, the variable "No goal" is coded one if the client only selects the proposal "Neither", and zero if the client selects one or multiple goals in addition to "Neither". The study of investment goals is promising in retail clients' investment decision making. Actually, setting investment goals represents a preliminary step driving retail clients' financial decisions resulting from mental accounting (Thaler, 1985, 1990 and 1999). Specifically, mental accounting describes the way individuals earmark their funds. Consequently, knowing self-assessed investment goals enables to understand funds categorization into savings accounts and financial products. The relationship between investment goals, mental accounting and investment decisions is thoroughly analyzed in Chapter 3.

The analysis of risk tolerance reveals that a large proportion of retail clients (around 69%) are not risk tolerant at all. Briefly, around 31% of retail clients are risk tolerant like US households, for whom that percentage is around 32.5% (Hong et al., 2004). According to Hoffmann et al. (2015), risk tolerance has an impact on retail investors' actual trading and risk-taking behavior. For this reason, the variable "Risk tolerance" is implemented throughout our studies (Chapters 2, 3 and 4).

As for attitudes towards losses, we notice that about a quarter of retail clients would wait until their portfolio value increases during a downturn. Around 21% of them would sell the entire portfolio or a part of it. Only 6% would acquire additional securities. According to Dimmock and Kouwenberg (2010), higher loss aversion is associated with a lower probability of participating in equity markets. Specifically, higher loss aversion reduces the probability of direct stockholding by significantly more than the probability of holding mutual funds. The variable "Attitudes twd losses" is then considered for the study of stock market participation (Chapter 2) and portfolio allocation choices (Chapter 4).

Finally, we build a financial literacy score from the MiFID questions assessing retail clients' financial knowledge (Table 1.4.9). This score is ranked from 0 (no financial knowledge) to 4 (high level of financial knowledge) according to a summing scale measuring whether retail clients know the risk associated with stocks (1), bonds (1), unusual financial products (1) and whether they know financial market functioning (1). In fact, the knowledge of unusual financial products is assessed through the last four questions (Table 1.4.9) dealing with the knowledge of warrants, differed service settlement, convertible bonds and other financial instruments, respectively. For these unusual products, Cronbach's alpha is about 0.90, which is above the cut-off level of 0.70 for reliability (Hair et al., 1998)³³. As for the knowledge of financial market functioning, it is assessed through two questions dealing with the change of order execution and existence of different types of orders, respectively. Likewise, we compute Cronbach's alpha and find a value of about 0.92 confirming thus high reliability. The impact of financial literacy on financial decision-making has been studied in the literature. Indeed, individuals with low financial literacy are much less likely to participate in the stock market (van Rooij et al., 2011) but also in the derivatives markets (Hsiao and Tsai, 2018). The economic importance of financial literacy is pointed out by Lusardi and Mitchell (2014). Therefore, financial literacy is considered through our studies (Chapters 2³⁴, 3 and 4). In our sample, we find that retail clients' financial literacy score is, on average, about 1.96 (out of 4).

³³Widely used in psychometric tests, Cronbach's alpha (noted α) consists in detecting relevant questions in survey design and can be applied in both dichotomous and polytomous questions. Comprised between 0 and 1, it helps understanding how items measure the same dimension. A higher degree of consistency denotes that items are homogeneous in content. Cronbach's alpha has also been used by Hoffmann et al. (2015) for ensuring reliability of their measurement.

³⁴Since the positive frame may bias retail clients' answers (Table 1.4.9), we introduce financial literacy in the robustness checks (Chapters 2 and 3). In Chapter 2, we analyze separately the four financial literacy items to accurately test whether each of them has a significant impact on the decision to invest in the stock market (van Rooij et al., 2011, 2012 and Almenberg and Dreber, 2015). Therefore, our choice enables to ensure that our findings on financial literacy are robust. In Chapter 4, there is no inconvenient to use financial literacy throughout the analysis because the main purpose is to investigate the significant differences between investors investing in overseas and those only investing in the domestic market.

Table 1.6.1 – MiFID variable definitions

Variables	Definitions
<i>Investment goals</i>	
Saving	Dummy variable coded 1 if the client aims to build precautionary savings and 0 otherwise.
Real estate project	Dummy variable coded 1 if the client aims to prepare a real estate project and 0 otherwise.
Additional income	Dummy variable coded 1 if the client aims to get additional income and 0 otherwise.
Preparing retirement	Dummy variable coded 1 if the client aims to prepare his/her retirement and 0 otherwise.
Capital appreciation	Dummy variable coded 1 if the client aims to appreciate his/her capital and 0 otherwise.
Patrimony transmission	Dummy variable coded 1 if the client aims to prepare his/her patrimony transmission and 0 otherwise.
No goal	Dummy variable coded 1 if the client has no investment goal and 0 otherwise.
.....	
Risk tolerance	Self-assessed risk tolerance referring to the MiFID question “As a general rule, which assertion best describes you?”. Modalities are ranked from 0 to 2: 0 (accepting lower remuneration by taking no risk on the invested capital), 1 (seeking better remuneration by taking a capital risk) and 2 (seeking high performance by accepting a significant part of capital risk).
.....	
Attitudes twd losses	Self-assessed attitudes towards losses referring to the MiFID question “If in the coming months, your portfolio value would decrease by 15%, what would you do?”. Modalities are ranked from 1 to 4: 1 (selling the entire portfolio), 2 (selling part of the portfolio), 3 (waiting until the portfolio value increases) and 4 (taking advantage of lower prices to invest again).
.....	
Financial literacy	Self-assessed financial literacy referring to the MiFID question “What is your investment experience”. Modalities are ranked from 0 (no financial knowledge) to 4 (high level of financial knowledge) according to a summing scale measuring whether the retail investor knows the risk associated with stocks (1), bonds (1) and other peculiar financial products (1), e.g. warrants, deferred service settlements, convertible bonds or other financial instruments, and whether he/she understands financial market functioning (1), e.g. change of order execution delay or existence of different types of orders.

Table 1.6.1 defines MiFID variables.

Table 1.6.2 – Descriptive statistics of MiFID variables

Variables	Modalities	N	$\bar{X}/\%$	std	min	max
<i>Investment goals</i>						
Saving	-	81,699	56.23%	-	-	-
Real estate project	-	81,699	12.75%	-	-	-
Additional income	-	81,699	5.89%	-	-	-
Preparing retirement	-	81,699	11.66%	-	-	-
Capital appreciation	-	81,699	20.74%	-	-	-
Patrimony transmission	-	81,699	14.86%	-	-	-
No goal	-	81,699	22.11%	-	-	-
.....						
Risk tolerance						
	0	74,370	69.34%	-	-	-
	1	74,370	28.86%	-	-	-
	2	74,370	1.80%	-	-	-
.....						
Attitudes twd losses						
	1	74,654	14.40%	-	-	-
	2	74,654	6.27%	-	-	-
	3	74,654	73.77%	-	-	-
	4	74,654	5.56%	-	-	-
.....						
Financial literacy		52,333	1.96	1.15	0	4

Table 1.6.2 displays descriptive statistics of MiFID variables available for more than 50,000 retail clients. The first column reports variable names. The second column reports modalities. The third column indicates the number of retail clients (N) for which the corresponding variable is available. The fourth column indicates the proportion (%) of retail clients for which the corresponding variable is equal to one for binary variables and the mean ($\bar{X}$) for continuous variables. The fifth, sixth and seventh columns report the standard deviation (std), minimum (min) and maximum (max) values.

1.6.2 Banking record variables

Looking at Table 1.6.4, we first point out that our sample is characterized by gender parity. Indeed, male retail clients only represent about 51% of the sample while this proportion is around 80% in the US (Barber and Odean, 2001) and in Europe (Bauer et al., 2009, Boolell-Gunesh et al., 2009 and Richards et al., 2017). Our sample is alike the one studied in East Asia (Feng and Seasholes, 2005, 2008). Therefore, the mandatory data collection through the MiFID questionnaire enable to focus on a significant sample size where male and female retail clients are equally represented. Our sample is then exempt of any selection bias. Therefore, we have the unique opportunity to control for any gender gap differences in subjective attributes (Dataset 1). Indeed, men are usually known to be less risk tolerant (Bollen and Posavac, 2018), less loss averse (Rau, 2014) and more financial literate (Almenberg and Dreber, 2015) than women. Likewise, gender differences are also observed in behavioral biases. For

example, men are more overconfident (Barber and Odean, 2001) and more subject to the disposition effect (Talpsepp, 2010) than women. As a general rule, gender differences in overconfidence are more pronounced in a masculine task, such as math or finance (Prince, 1993 and Beyer and Bowden, 1997). Furthermore, according to Niederle and Vesterlund (2007), men prefer entering more into a competitive environment than women. Indeed, these authors indicate that men mostly focus on potential benefits contrary to women who mostly focus on potential costs. Men attribute their past success to their abilities whereas women, to luck.

Retail clients are, on average, 48 years old³⁵. In the US, Barber and Odean (2002) and Dhar and Zhu (2006) find an average age of about 50 years old. Using Chinese data, Feng and Seasholes (2005) indicate that the average age of investors is about 35. Older investors are known to be less subject to the disposition bias (Dhar and Zhu, 2006, Talpsepp 2010 and Tekçe and Yılmaz, 2015), overconfidence bias (Glaser, 2003) and diversification bias (Goetzmann and Kumar, 2008). As for subjective attributes, older individuals are more loss averse (Johnson et al., 2006 and Gächter et al., 2010). However, results are not clear cut for attitudes towards risk. Bakshi and Chen (1994) show that risk aversion increases with population's age whereas Wang and Hanna (1997) explain that risk tolerance increases with age. Looking at asset allocations, Bodie and Crane (1997) show that the proportion of risky assets decreases with age and increases with wealth. Likewise, Ackert et al. (2002) show that age impacts the mix of risky assets in the US: young households prefer investing more in stocks than in bonds. Besides, Korniotis and Kumar (2011) find that older investors have greater investment knowledge, however, investment skills deteriorate due to the cognitive aging. Therefore, the negative effect of age dominates its positive effect. Recently, Brooks et al. (2018) find evidence that risk tolerance declines at an increasing rate with age. Furthermore, there is also evidence that the relationship between risk aversion and age is not linear. Indeed, Riley and Chow (1992) find a U-shaped relationship indicating that risk aversion decreases with age then increases after 65.

Looking at the geographical criteria, we first notice that about 84% of retail clients were born in France ("Native") and about 12% of them are living in the Paris region ("Paris"). These two proportions are in line with the French demography (INSEE³⁶). These two variables are created because, according to Osili and Paulson (2007) and Chatterjee (2009), natives are more likely to invest in stocks than immigrants. In addition, Arrondel et al. (2010) show that French households living in Paris are more

³⁵In psychology, Horn (1968), Salthouse (2000) and Schroeder and Salthouse (2004) show that physical and cognitive abilities, more precisely memory, weaken with age. Thereby, information treatment is slower and ability to perceive conditional probabilities declines in older people (Spaniol and Bayen, 2005). According to Lindenberger and Baltes (1994) and Baltes and Lindenberger (1997), intelligence level decreases with age due to a weakening of cognitive abilities. However, this decline does not occur if the individual is in his expertise area (Masunaga and Horn, 2001). This decrease is slower in the most educated people, who have high level of income and wealth and who exercise intellectual professions (Baltes and Lang, 1997 and Cagney and Lauderdale, 2002). Previously, Shanan and Sagiv (1982) point out that the weakening of cognitive abilities due to the age is more important in older women. Moreover, this decline also affects decision-making performance. Indeed, as cognitive abilities decline with age, older individuals perform less well than younger ones (Finucane et al., 2002 and Finucane, Mertz, Slovic and Schmidt, 2005).

³⁶About 11.6% of the French population were born abroad (INSEE, 2014) and about 18.8% of them live in the Paris region (INSEE, 2015).

likely to hold risky assets. As for Tekçe and Yilmaz (2015), retail investors living in more developed regions exhibit less overconfident behavior, i.e. have a high turnover, than those living in less developed regions. For these reasons, we are particularly interested in the Paris region because it is the most developed French region concentrating more than one third of the national wealth (INSEE, 2014) and includes the biggest French city, which reflects the high cost of life and international relations. In sum, “Native” and “Paris” are studied throughout Chapters 2, 3 and 4 since they impact individuals’ financial decision-making.

Among the different French matrimonial regimes, we especially pay attention to the separation regime (“Matrimonial”). As its name suggests, the separation regime means that there is no joint-ownership between spouses. As a matter of fact, it enables individuals to behave as they were single since any increase or decrease in the wealth level of a spouse does not impact the wealth level of the other spouse. The separation regime choice gives much more useful insights on retail clients than marital status because it captures the notion of financial independence. The study of the matrimonial regime choice has not yet been undertaken in the behavioral finance literature. We are then the first to analyze it.

We create four socio-professional categories: self-employed, salaried, retired and those who have no professional occupation. According to MacCrimmon and Wehrung (1986), individuals perceiving their income directly from their own activity are willing to take more risks than those having straight salary or wage. In the same vein, Georgarakos and Inderst (2014) show that the self-employed are more likely to invest in stocks than the employed. The distinction self-employed/salaried enables to test whether being financially independent from an employer impacts the decision to participate in financial markets (Chapters 2, 3 and 4). In addition, Fagereng et al. (2017) find that households tend to reduce their portfolio share and exit the stock market near their retirement. We then expect to get similar results for “Retired”.

Looking at the wealth and patrimony indicators, we notice that the average net monthly income is around €2,429 and the average bank loan amount is around €28,216³⁷. These two amounts are in line with the income and indebtedness situation of French households³⁸. A higher income is usually associated with a low likelihood to exhibit behavioral biases. For example, retail investors with high income levels are less subject to the disposition bias (Dhar and Zhu, 2006), diversification bias (Goetzmann

³⁷In our study, the net monthly income (“Income”) and the bank loan amount (“Bank loan”) have been extracted from Dataset 1 due to the large number of missing data in Dataset 2. Indeed, the net monthly income and the bank loan amount are not available in Dataset 2 for more than 75% of the sample. For this reason and because of these two variables impact financial decisions (Agnew et al., 2003 and Cardak and Wilkins, 2009), we use their corresponding MiFID data. In the questionnaire, there are six net monthly income brackets (Table 1.4.2) and four bank loan brackets (Table 1.4.5). In our study, we use their midpoint values. For the net monthly income, the midpoint values are 0; 750; 2,250; 4,000; 7,500 and 10,000 (the lower bound), respectively. As for the bank loan amount, we get the following midpoint values: 0; 5,000; 55,000 and 100,000 (the lower bound), respectively.

³⁸According to INSEE, the average net monthly income is approximately €2,250 and the average amount of indebtedness is €33,100 in 2015. Therefore, the use of declared amounts gives useful insights since our sample is representative of the whole French population regarding the income and indebtedness situation.

and Kumar, 2008) and overconfidence bias (Tekçe and Yilmaz, 2015). High income is then considered like a security barrier since the intensity of all behavioral biases is reduced for retail investors with higher income levels. Income also positively affects the decision to own stocks (Agnew et al., 2003 and Grinblatt et al., 2011) while bank loan amount exercises the reverse effect (Guiso and Sodini, 2013). Indeed, bank loan constrained households are less likely to invest in risky assets (Cardak and Wilkins, 2009). Then, savings account analysis reveals that the most popular savings accounts is regulated savings accounts (53%) followed by life insurance (31%). Home and standard savings accounts are held approximately by 21% and 12% of clients, respectively. As for financial product holdings, we point out that financial market participation is low in France. A closer examination at financial products reveals that retail clients hold more diversified products, such as unit-linked life insurance (15%) and mutual funds (8%), than single products for which we observe low ownership rates (less than 5%). Finally, the average portfolio value is around €49,000. Portfolio value is a better proxy for measuring wealth level in retail investors (Chapter 4), while income is the most appropriate for retail clients (Chapters 2 and 3).

Table 1.6.3 – Banking record variable definitions

Variables	Definitions
SOCIO-DEMOGRAPHIC INDICATORS	
Gender	Dummy variable coded 1 for males and 0 for females.
Age	Age of the retail investor as of the 07/31/2015 (in years).
Native	Dummy variable coded 1 if the retail investor is native of the country and 0 otherwise.
Paris	Dummy variable coded 1 if the retail investor lives in and close to the capital (and biggest city) of the country and 0 otherwise.
Matrimonial	Dummy variable coded 1 if the retail investor is subjected to the separation of property legal regime and 0 otherwise.
Self-employed	Dummy variable coded 1 if the retail investor perceives directly his/her income from his/her own professional activity and 0 otherwise.
Salaried	Dummy variable coded 1 if the retail investor has a wage or salary from an employer and 0 otherwise.
Retired	Dummy variable coded 1 if the retail investor is retired and 0 otherwise.
No occupation	Dummy variable coded 1 if the retail investor has no occupation (e.g. students and those having no professional activity) and 0 otherwise.
WEALTH AND PATRIMONY INDICATORS	
Income	Net monthly income (in euros).
Bank loans	Bank loan amount remaining to be reimbursed (in euros).
<i>Savings accounts</i>	
Regulated savings accounts	Dummy variable coded 1 if the client holds regulated savings accounts and 0 otherwise.
Standard savings accounts	Dummy variable coded 1 if the client holds standard savings accounts and 0 otherwise.
Home savings accounts	Dummy variable coded 1 if the client holds home savings accounts and 0 otherwise.
Life insurance	Dummy variable coded 1 if the client holds life insurance savings accounts and 0 otherwise.
<i>Financial products</i>	
Stocks	Dummy variable coded 1 if the client holds stocks and 0 otherwise.
Funds	Dummy variable coded 1 if the client holds mutual funds and 0 otherwise.
Warrants	Dummy variable coded 1 if the client holds warrants and 0 otherwise.
Bonds	Dummy variable coded 1 if the client holds bonds and 0 otherwise.
UL life insurance products	Dummy variable coded 1 if the client holds unit-linked life insurance products and 0 otherwise.
Retirement	Dummy variable coded 1 if the client holds retirement plans and 0 otherwise.
Portfolio value	Total investment assets value of the retail investor as of the 07/31/2015 (in euros).

Table 1.6.3 defines banking record variables.

Table 1.6.4 – Descriptive statistics of banking record variables

Variables	N	$\bar{X}/\%$	std	min	max
SOCIO-DEMOGRAPHIC INDICATORS					
Gender	81,703	51.23%	-	-	-
Age	81,703	48.21	17.62	18	105
Native	81,703	83.59%	-	-	-
Paris	79,974	12.14%	-	-	-
Matrimonial	81,065	10.44%	-	-	-
Self-employed	80,801	12.71%	-	-	-
Salaried	80,801	54.91%	-	-	-
Retired	80,801	15.61%	-	-	-
No occupation	80,801	16.77%	-	-	-
WEALTH AND PATRIMONY INDICATORS					
Income	80,789	2,429.01	2,210.30	0	10,000
Bank loans	80,561	28,215.82	38,797.92	0	100,000
Savings accounts					
Regulated savings accounts	81,703	52.50%	-	-	-
Standard savings accounts	81,703	11.89%	-	-	-
Home savings accounts	81,703	20.72%	-	-	-
Life insurance	81,703	31.10%	-	-	-
Financial products					
Stocks	81,703	4.79%	-	-	-
Funds	81,703	8.37%	-	-	-
Warrants	81,703	0.16%	-	-	-
Bonds	81,703	0.65%	-	-	-
UL life insurance products	81,703	14.96%	-	-	-
Retirement	81,703	1.25%	-	-	-
Portfolio value	81,703	49,493.58	9,204,516	0	2.60e+09

Table 1.6.4 displays descriptive statistics of banking record variables available for more than 70,000 retail clients. The first column reports variable names. The second column indicates the number of retail clients (N) for which the corresponding variable is available. The third column indicates the proportion (%) of retail clients for which the corresponding variable is equal to one for binary variables and the mean ($\bar{X}$) for continuous variables. The fourth, fifth and sixth columns report the standard deviation (std), minimum (min) and maximum (max) values.

1.7 Unreported answers and answers stability analysis

In this section, we focus on retail clients' MiFID questionnaire answers regarding their investment goals, risk tolerance, attitudes towards losses and financial literacy. We remind that the MiFID questionnaire was completed a maximum of three times by 100,590 retail clients over the 2007-2015 period.

Three retail client categories are distinguished depending on the number of times they have completed the MiFID questionnaire. The Q1, Q2 and Q3 categories gather retail clients who have completed once (N=64,472 retail clients), twice (N=23,416 retail clients) and thrice (N=12,702 retail clients) the MiFID questionnaire, respectively. For each retail client category (Q1, Q2 and Q3), we analyze their answers to the first questionnaire ("Questionnaire 1"), to the second questionnaire ("Questionnaire 2" available for Q2 and Q3 retail clients) and to the third questionnaire ("Questionnaire 3" available only for Q3 retail clients). Whatever the order in which the questionnaire was completed, we report the number of unreported answers (noted "nr" hereafter).

We check the answers' stability of retail clients having answered at least two times the MiFID questionnaire (i.e. Q2 and Q3 retail clients) by computing the agreement rates for answers between two successive questionnaires. For each MiFID question, we look at the answers given by retail clients in the two successive questionnaires and compute the percentage of retail clients having given the same answers over time³⁹.

We additionally analyze retail clients' answers regarding their net monthly income and their bank loan amount.

Investment goals

Table 1.7.1 indicates that the number of unreported answers on investment goals is very low whatever the number of times retail clients have answered the questionnaire. More interestingly, we notice that the number of retail clients having no investment goal decreases from one questionnaire to another, meaning that retail clients focus more on their future financial planning over time. We also computed retail clients' answers stability. We find that on average, 91.51% of retail clients made the same investment goal choice over time.

³⁹We compute the agreement rate by considering retail clients for which we have information in the two datasets.

Table 1.7.1 – Questionnaire answers for investment goals

Retail client categories	Questionnaire orders	Saving	Real estate project	Additional income	Preparing retirement	Capital appreciation	Patrimony transmission	No goal	nr	N
Q1	Questionnaire 1									
	Number	33,101	5,915	2,276	4,179	6,645	4,940	21,845	6	64,472
	Proportion	51.34%	9.17%	3.53%	6.48%	10.31%	7.66%	33.88%	0.01%	100%
Q2	Questionnaire 1									
	Number	11,421	2,910	1,250	2,772	4,193	2,853	6,527	4	23,416
	Proportion	48.77%	12.43%	5.34%	11.84%	17.91%	12.18%	27.87%	0.02%	100%
	Questionnaire 2									
	Number	14,557	3,396	1,482	3,307	5,925	4,037	3,301	0	23,416
Q3	Proportion	62.17%	14.50%	6.33%	14.12%	25.30%	17.24%	14.10%	0%	100%
	Questionnaire 1									
	Number	6,178	1,743	1,218	2,259	4,140	2,775	2,246	2	12,702
	Proportion	48.64%	13.72%	9.59%	17.78%	32.59%	21.85%	17.68%	0.02%	100%
	Questionnaire 2									
	Number	7,283	1,905	1,302	2,501	5,079	3,526	1,106	0	12,702
	Proportion	57.34%	15%	10.25%	19.69%	39.99%	27.76%	8.71%	0%	100%
	Questionnaire 3									
	Number	7,808	1,906	1,399	2,500	5,783	4,056	694	0	12,702
	Proportion	61.47%	15.01%	11.01%	19.68%	45.53%	31.93%	5.46%	0%	100%

Table 1.7.1 reports the number and the proportion of retail clients who have answered the question dealing with investment goals while considering the number of times they have answered the questionnaire, and the order in which the questionnaire has been administered by the bank. There are seven proposals: building precautionary savings (“Saving”), preparing a real estate project (“Real estate project”), getting additional income (“Additional income”), preparing your retirement (“Preparing retirement”), appreciating your capital (“Capital appreciation”), preparing your patrimony transmission (“Patrimony transmission”) and neither (“No goals”). We also report the number and the proportion of retail clients who did not answer the question (“nr” for non-reported). N denotes the number of retail clients.

Risk tolerance

Table 1.7.2 – Questionnaire answers for risk tolerance

Retail client categories	Questionnaire orders	Modalities			nr	N
		0	1	2		
Q1	Questionnaire 1					
	Number	43,216	10,067	546	10,643	64,472
	Proportion	67.03%	15.61%	0.85%	16.51%	100%
Q2	Questionnaire 1					
	Number	14,322	5,325	306	3,463	23,416
	Proportion	61.16%	22.74%	1.31%	14.79%	100%
	Questionnaire 2					
	Number	15,525	6,933	407	551	23,416
	Proportion	66.30%	29.61%	1.74%	2.35%	100%
Q3	Questionnaire 1					
	Number	6,651	4,600	306	1,145	12,702
	Proportion	52.36%	36.21%	2.42%	9.01%	100%
	Questionnaire 2					
	Number	6,700	5,381	392	229	12,702
	Proportion	52.75%	42.36%	3.09%	1.80%	100%
	Questionnaire 3					
	Number	6,066	6,122	475	39	12,702
	Proportion	47.76%	48.20%	3.74%	0.30%	100%

Table 1.7.2 reports the number and the proportion of retail clients who have answered the question regarding risk tolerance while considering the number of times they have answered the questionnaire, and the order in which the questionnaire has been administered by the bank. There are three proposals to which we attribute modalities ranked from 0 to 2, depending on the risk tolerance level: “Accepting lower remuneration by taking no risk on the invested capital” (coded 0), “Seeking better remuneration by accepting a capital risk” (coded 1) and “Seeking high performance by accepting a significant part of capital risk” (coded 2). N refers to the number of retail clients. “nr” denotes the number and the proportion of unreported answers. N refers to the number of retail clients.

Table 1.7.2 indicates that, whatever the number of times retail clients have answered the questionnaire, the third proposal is rarely chosen. Only a small number of retail clients (less than 4%) declare to be able to bear a significant part of capital risk. Retail clients mainly focus on the first two proposals dealing with the risk/return trade-off. We point out that the number of unreported answers decreases significantly from one questionnaire to another one. Besides, we note that the answers’ stability rate is on average 88.16%.

Attitudes towards losses

Table 1.7.3 – Questionnaire answers for attitudes towards losses

Retail client categories	Questionnaire orders	Modalities				nr	N
		1	2	3	4		
Q1	Questionnaire 1						
	Number	9,925	3,218	38,964	2,155	10,210	64,472
	Proportion	15.39%	4.99%	60.44%	3.34%	15.84%	100%
Q2	Questionnaire 1						
	Number	2,845	1,108	14,976	1,208	3,279	23,416
	Proportion	12.15%	4.73%	63.96%	5.16%	14%	100%
	Questionnaire 2						
	Number	3,038	1,333	17,149	1,357	539	23,416
	Proportion	12.97%	5.69%	73.24%	5.80%	2.30%	100%
Q3	Questionnaire 1						
	Number	1,215	622	8,834	945	1,086	12,702
	Proportion	9.57%	4.89%	69.55%	7.44%	8.55%	100%
	Questionnaire 2						
	Number	1,188	664	9,636	1,018	196	12,702
	Proportion	9.35%	5.23%	75.86%	8.01%	1.55%	100%
	Questionnaire 3						
	Number	1,078	699	9,840	1,054	31	12,702
	Proportion	8.49%	5.50%	77.47%	8.30%	0.24%	100%

Table 1.7.3 reports the number and the proportion of retail clients who have answered the question regarding their attitudes towards losses while considering the number of times they have answered the questionnaire, and the order in which the questionnaire has been administered by the bank. There are four proposals to which we attribute the modalities ranked from 1 to 4: “Selling all” (coded 1), “Selling a part of your portfolio” (coded 2), “Waiting until the portfolio value increases (coded 3) and “Taking advantage of lower prices to invest again” (coded 4). “nr” denotes the number and the proportion of retail clients who did not answer the question. N refers to the number of retail clients.

Table 1.7.3 shows that many retail clients prefer waiting until their portfolio value increases (modality coded 3) during a downturn. Therefore, they may expect that their portfolio value gets back to the baseline level. However, the tendency to hold longer losing securities (i.e. securities whose prices have decreased since their purchase) characterizes a part of the disposition bias (Shefrin and Statman, 1985) together with the tendency to sell too soon winning securities (i.e. securities whose prices have increased since their purchase) which is not recorded in our data. Despite of its attractive aspect (“Taking advantage of lower prices to invest again”), the last proposal has only been chosen by a few retail clients. Comparing selling to buying behaviors, we notice that retail clients have a high tendency to sell (the entire or a part of their portfolio) than to buy additional financial securities during the downturn. The number of unreported answers decreases significantly between two successive questionnaires. However, a closer examination of retail clients’ choices across questionnaires reveals that they are more likely to keep a fraction (modality 2) or their entire portfolio (modality 3), or even, to accumulate further securities (modality 4) over time rather than to sell their entire portfolio (modality 1). Therefore, retail clients may become less sensitive to losses as they fill in the questionnaire many times or, equivalently, as they get older. Finally, we note that on average 93.26% of retail clients made the same choice over time.

Financial literacy

In Table 1.7.4, we notice that the number of unreported answers decreases significantly between two successive questionnaires generating thus higher differences between yes/no answers. Whatever the question on financial knowledge, we notice that, for Q2 and Q3 retail clients, the percentage of “yes” increases not surprisingly with time.

Results show that retail clients are more familiar with stocks than with bonds. Although the questions related to the knowledge of stocks and bonds are subject to a positive frame, retail clients know more often the risk associated with stocks than with bonds. Note that these percentages are high relative to the ownership rate that we document in Chapters 2 and 3 because the question was “Have you ever bought or held?”. As for unusual financial products, we shed light on the higher number of unreported answers, even though it decreases from one questionnaire to another one. Furthermore, the percentage of “no” always exceeds that of “yes”. Thus, retail clients may feel less comfortable with these products which are more complex to understand than the classical ones (i.e. stocks and bonds). Concerning the knowledge of financial market functioning, we note that the proportion of unreported answers is very low (none exceed 5%). The percentage of “no” is higher than that of “yes”. Finally, we note that on average 91.95% of retail clients gave similar answers over time.

Table 1.7.4 – Questionnaire answers for financial literacy

Retail client categories	Questionnaire orders	Stocks			Bonds			Markets			Unusual products			N
		yes	no	nr	yes	no	nr	yes	no	nr	yes	no	nr	
Q1	Questionnaire 1													
	Risk knowledge	25,718	28,721	10,033	18,252	36,218	10,002	6,347	55,265	2,860	4,369	26,613	33,490	64,472
		39.89%	44.55%	15.56%	28.31%	56.18%	15.51%	9.84%	85.72%	4.44%	6.77%	41.28%	51.95%	100%
	Holding	12,895	41,594	9,983	8,154	46,305	10,013				1,408	29,528	33,536	64,472
		20%	64.51%	15.49%	12.65%	71.82%	15.53%				2.18%	45.80%	52.02%	100%
Q2	Questionnaire 1													
	Risk knowledge	12,462	7,698	3,256	8,869	11,286	3,261	1,348	21,569	499	2,555	10,672	10,189	23,416
		53.22%	32.87%	13.91%	37.88%	48.20%	13.92%	5.76%	92.11%	2.13%	10.91%	45.58%	43.51%	100%
	Holding	7,463	12,698	3,255	4,439	15,709	3,268				873	12,329	10,214	23,416
		31.87%	54.23%	13.90%	18.96%	67.09%	13.95%				3.73%	52.65%	43.62%	100%
	Questionnaire 2													
	Risk knowledge	14,456	8,462	498	10,198	12,717	501	5,324	17,864	228	2,855	13,947	6,614	23,416
		61.74%	36.14%	2.12%	43.55%	54.31%	2.14%	22.74%	76.29%	0.97%	12.19%	59.56%	28.25%	100%
Q3	Holding	8,554	14,361	501	5,197	17,716	503				1,025	15,767	6,624	23,416
		36.53%	61.33%	2.14%	22.19%	75.66%	2.15%				4.38%	67.33%	28.29%	100%
	Questionnaire 1													
	Risk knowledge	8,777	2,846	1,079	6,478	5,147	1,077	1,112	11,477	113	2,088	6,919	3,695	12,702
		69.10%	22.41%	8.49%	51%	40.52%	8.48%	8.75%	90.36%	0.89%	16.44%	54.47%	29.09%	100%
	Holding	6,361	5,263	1,078	4,146	7,475	1,081				892	8,107	3,703	12,702
		50.08%	41.43%	8.49%	32.64%	58.85%	8.51%				7.03%	63.82%	29.15%	100%
	Questionnaire 2													
	Risk knowledge	9,521	2,990	191	7,046	5,462	194	3,175	9,457	70	2,274	7,763	2,665	12,702
		74.96%	23.54%	1.50%	55.47%	43%	1.53%	25%	74.45%	0.55%	17.90%	61.12%	20.98%	100%
	Holding	6,913	5,600	189	4,525	7,986	191				983	9,056	2,663	12,702
		54.42%	44.09%	1.49%	35.62%	62.87%	1.51%				7.73%	71.30%	20.97%	100%
	Questionnaire 3													
	Risk knowledge	9,883	2,790	29	7,402	5,271	29	5,014	7,661	27	2,356	8,544	1,802	12,702
		77.80%	21.97%	0.23%	58.27%	41.50%	0.23%	39.47%	60.31%	0.22%	18.55%	67.26%	14.19%	100%
	Holding	7,233	5,440	29	4,784	7,889	29				1 037	9,859	1,806	12,702
		56.94%	42.83%	0.23%	37.66%	62.11%	0.23%				8.16%	77.62%	14.22%	100%

Table 1.7.4 reports the number and the proportion of retail clients who have answered the questions dealing with knowledge and experience of financial markets while considering the number of times they have answered the questionnaire, and the order in which the questionnaire has been administered by the bank. The bank assesses retail clients whether they know the risk (*Risk knowledge*) associated with stocks (“Stocks”), bonds (“Bonds”) and unusual financial products (“Unusual products” referring to warrants, differed settlement service, convertible bonds and other financial investments) as well as whether they know financial market functioning (“Markets”). Additionally, the bank assesses whether retail clients hold (*Holding*) each of these financial products. “nr” denotes the number and the proportion of retail clients who did not answer the questions. N refers to the number of retail clients.

Income

TABLE 1.7.5 – Questionnaire answers for net monthly income

Categories	Questionnaires order	0	]0 ;1,500[	[1,500 ;3,000[	[3,000 ;5,000[	[5,000 ;10,000[	[10,000 ;+ [	nr	N
Q1	Questionnaire 1								
	Number	15,016	17,644	18,488	7,695	3,056	942	1,631	64,472
	Proportion	23.29%	27.37%	28.68%	11.94%	4.74%	1.45%	2.53%	100%
Q2	Questionnaire 1								
	Number	2,957	6,637	7,893	3,253	1,514	583	579	23,416
	Proportion	12.63%	28.34%	33.71%	13.89%	6.47%	2.49%	2.47%	100%
	Questionnaire 2								
	Number	2,588	6,810	8,280	3,431	1,572	646	89	23,416
	Proportion	11.05%	29.08%	35.36%	14.65%	6.71%	2.76%	0.39%	100%
Q3	Questionnaire 1								
	Number	696	3,366	4,689	2,102	1,128	510	211	12,702
	Proportion	5.48%	26.50%	36.92%	16.55%	8.88%	4.02%	1.65%	100%
	Questionnaire 2								
	Number	598	3,326	4,886	2,168	1,179	521	24	12,702
	Proportion	4.71%	26.18%	38.47%	17.07%	9.28%	4.10%	0.19%	100%
	Questionnaire 3								
	Number	541	3,216	4,994	2,188	1,209	547	7	12,702
	Proportion	4.25%	25.32%	39.32%	17.23%	9.52%	4.31%	0.05%	100%

Table 1.7.5 reports the number and the proportion of retail clients corresponding to each net income bracket (expressed in euros) while considering the number of times they have answered the questionnaire and the order in which the questionnaire has been administered by the bank. “nr” denotes the number and the proportion of retail clients who did not answer the question. N refers to the number of retail clients.

Table 1.7.5 shows that, whatever the number of questionnaires administered, the highest proportion corresponds to the third income bracket, i.e. net income between €1,500 and €3,000 per month. Besides, about a quarter of retail clients indicate that their net monthly income is comprised between €0 and €1,500. In all, we can notice that retail clients’ income level is medium since more than half of clients earns less than €3,000 per month. The proportion of unreported answers is surprisingly low. Retail clients may have a higher tendency to give information about their financial situation since their resources are managed by the bank. A significant decrease of the number of unreported answers is observed between two successive questionnaires. Unsurprisingly, there is a slight increase of retail clients’ income over time. On average, 86.36% of retail clients reported the same net monthly income bracket over time.

Bank loan amounts

TABLE 1.7.6 – Questionnaire answers for bank loan amount

Categories	Questionnaires order	0	]0 ;10,000[	[10,000 ;100,000[	[100,000 ;+]	nr	N
Q1	Questionnaire 1						
	Number	37,666	6,644	9,027	9,098	2,037	64,472
	Proportion	58.42%	10.31%	14%	14.11%	3.16%	100%
Q2	Questionnaire 1						
	Number	12,200	3,168	4,142	3,208	698	23,416
	Proportion	52.10%	13.53%	17.69%	13.70%	2.98%	100%
	Questionnaire 2						
	Number	12,121	3,213	4,312	3,666	104	23,416
	Proportion	51.76%	13.72%	18.41%	15.66%	0.45%	100%
Q3	Questionnaire 1						
	Number	6,357	1,840	2,487	1,771	247	12,702
	Proportion	50.05%	14.49%	19.58%	13.94%	1.94%	100%
	Questionnaire 2						
	Number	6,352	1,814	2,526	1,981	29	12,702
	Proportion	50.01%	14.28%	19.89%	15.60%	0.22%	100%
	Questionnaire 3						
	Number	6,295	1,813	2,527	2,058	9	12,702
	Proportion	49.56%	14.27%	19.89%	16.20%	0.08%	100%

Table 1.7.6 reports the number and the proportion of retail clients corresponding to each bank loan amount bracket (expressed in euros) while considering the number of times they have answered the questionnaire and the order in which the questionnaire has been administered by the bank. “nr” denotes the number and the proportion of retail clients who did not answer the question. N refers to the number of retail clients.

Table 1.7.6 indicates that around half of retail clients have no bank loan amount to repay. We notice that the number of indebted retail clients is well-distributed across bank loan amount brackets. The proportion of unreported answers is low like it is for income (Table 1.7.5). Finally, 86.47% of retail clients reported the same bank loan bracket over time.

1.8 Conclusion

In this chapter, we have shown that systematic biases lead retail investors to take suboptimal investment decisions and, consequently, are responsible of asset mispricing. A consistent methodology is necessary to detect which investors are more likely to exhibit such biases *ex ante* and the mandatory MiFID questionnaire can be helpful in this respect.

We have the opportunity to study the MiFID questionnaire answers of retail clients of a large European retail bank together with their banking records. This joint-analysis enables to draw an accurate picture of retail clients’ savings and investment behaviors. The MiFID questionnaire answers gather information on retail clients’ subjective attributes, especially regarding their investment goals, risk tolerance, attitudes towards losses and financial knowledge. Banking records gather detailed objective attributes, some of which are rarely (e.g. the country of birth, the residency and, savings account and financial product holdings) or have not yet been studied (the choice of the matrimonial

regime) in the literature. Descriptive statistics show that our sample is representative of the whole French population.

This chapter presents all available data, descriptive statistics and also comments the MiFID questionnaire of the bank. In light of this whole information, in the next chapters, we contribute to the behavioral finance literature by studying the impact of MiFID data on stock market participation (Chapter 2), to investment discipline in the theoretical context of mental accounting (Chapter 3) and on the decision to invest in foreign individual stocks, or equivalently, the characteristics of sophisticated investors (Chapter 4).

Table 1.8.1 presents sample sizes in the different chapters. This size differs from one chapter to another one in order to consider retail clients for whom all variables which are relevant for the analysis are available. Table 1.8.1 also lists the MiFID variables that are included in each chapter. For example, the study of investment goal choices is relevant in the mental accounting framework (Chapter 3) due to financial planning, while it is not in Chapters 2 and 4 which, in turn, consider attitudes towards losses to assess the decision to invest in the stock market and overseas, respectively. In banking records, sociodemographic indicators are entirely considered throughout the chapters. As for wealth and patrimony indicators, income and bank loans are considered in retail clients-based chapters (i.e. Chapters 2 and 3), while they are not in Chapter 4, in which we especially focus on retail investors, i.e. retail clients holding stocks either directly or indirectly through mutual funds. Actually, portfolio value is a better proxy for measuring wealth level in retail investors than in retail clients⁴⁰. Savings accounts are entirely considered in Chapter 3 to accurately measure how retail clients earmark their funds into mental accounts. As for financial products, they are deeply analyzed in Chapters 3 and 4 regarding funds categorization and portfolio diversification, respectively. Chapter 2 does not consider warrant and bond holdings due to their low ownership rates (lower than 1%) in retail clients.

⁴⁰In Chapter 3, we use portfolio value to check the robustness of our findings.

Table 1.8.1 – Summary of variables under study into chapters 2, 3 and 4

Variables	Chapter 2	Chapter 3	Chapter 4
MiFID QUESTIONNAIRE ANSWERS			
Investment goals		x	
Risk tolerance	x	x	x
Attitudes twd losses	x		x
Financial literacy	x	x	x
.....			
BANKING RECORDS			
<i>Socio-demographic indicators</i>			
Gender	x	x	x
Age	x	x	x
Native	x	x	x
Paris	x	x	x
Matrimonial	x	x	x
Self-employed	x	x	x
Salaried	x	x	x
Retired	x	x	x
No occupation	x	x	x
<i>Wealth and patrimony indicators</i>			
Income	x	x	
Bank loans	x	x	
Savings accounts			
Regulated savings accounts		x	
Standard savings accounts		x	
Home savings accounts		x	
Life insurance		x	
Financial products			
Stocks	x	x	x
Funds	x	x	x
Warrants		x	x
Bonds		x	x
UL life insurance products	x	x	x
Retirement	x	x	x
Portfolio value		x	x
N retail clients	77,365*	68,190	50,040
N retail investors	-	-	7,133
N foreign retail investors	-	-	1,040

Table 1.8.1 displays the variables used in chapters 2, 3 and 4 and their corresponding sample size (N). Specifically, “N retail clients” is the number of retail clients. “N retail investors” is the number of retail investors, i.e. retail clients who directly or indirectly hold stocks. “N foreign retail investors” is the number of retail investors holding directly at least one foreign stock. The presence of a variable is denoted by “x” in the table. * means that there are three different sample sizes in Chapter 2 depending on the model we use. Actually, out of 77,365 retail clients, there are 71,461 retail clients for whom “Risk tolerance” and the selected banking record variables are available and 71,745 of retail clients for whom “Attitudes twd losses” and the selected banking record variables are available.

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Appendix

The MiFID questionnaire (1/5)

Entretien Epargne

La présente fiche d'entretien d'épargne s'inscrit dans le cadre de la réglementation en vigueur issue de la transposition de la Directive 2004/39/CE du 21 avril 2004.

Cette fiche a pour objet de recueillir des informations concernant les connaissances et l'expérience du Client Personne Physique en matière d'investissement en rapport avec le type spécifique de produit ou de service, sa situation financière et ses objectifs d'investissement.

Date de l'entretien : _____

☐ Mademoiselle ☐ Madame ☐ Monsieur

Nom : _____

Prénom(s) : _____

Date de naissance : _____

Ce questionnaire concerne :

☐ Vous-même ☐ Votre foyer

Situation familiale

☐ Marié(e)

☐ Divorcé(e)

☐ Célibataire

☐ Veuf/veuve

☐ Vie maritale

☐ Séparé(e)

Nombre d'enfant(s) à charge : _____

Revenus

Revenus mensuels nets :

☐ 0 €

☐ < 1 500 €

☐ 1 500 – 3 000 €

☐ 3 000 – 5 000€

☐ 5 000 – 10 000€

☐ plus de 10 000€

Ces revenus sont issus :

☐ D'une activité salariée

Nom de votre (vos) employeur(s) _____

☐ Activité non salariée (Profession libérale, Entrepreneur individuel)

☐ Retraite

☐ Autre (revenus locatifs,...)

The MiFID questionnaire (2/5)

Fonctionnement des comptes courants :

Quelle somme envisagez-vous approximativement de verser mensuellement sur vos comptes courants ?

Essentiellement sous la forme de : ☐ remises de chèques

☐ virements reçus

☐ remises espèces

Mouvements de/vers l'étranger

Vos comptes courants enregistreront-ils des mouvements réguliers ?

☐ Vers l'étranger (préciser leur nature) : _____

☐ En provenance de l'étranger (préciser leur nature) : _____

Patrimoine

Résidence principale

Concernant votre résidence principale, êtes vous ?

☐ Propriétaire

☐ Locataire

☐ Logé à titre gratuit

Votre patrimoine immobilier

A combien estimez-vous votre patrimoine immobilier (valeur brute) ?

☐ 0

☐ moins de 100 000 €

☐ 100 000 – 300 000 €

☐ plus de 300 000 €

Votre patrimoine mobilier

	Ø	< 5 000 €	< 15 000 €	< 50 000 €	Plus de 50 000 €
Epargne de précaution	☐	☐	☐	☐	☐
PEL / PEP	☐	☐	☐	☐	☐
Portefeuille Titres ou PEA	☐	☐	☐	☐	☐
Assurance Vie / PERP	☐	☐	☐	☐	☐
Autres	☐	☐	☐	☐	☐

The MiFID questionnaire (3/5)

Crédits ou Dettes

A combien estimez vous le montant total des crédits ou dettes vous restant à rembourser ?

- | | |
|---|--|
| ☐ 0 | ☐ moins de 10 000 € |
| ☐ 10 000 – 100 000 € | ☐ plus de 100 000 € |

Capacité d'épargne

Disposez-vous d'une somme à investir? ☐ OUI ☐ NON

Si oui, pour quel montant ? _____ €

A combien estimez vous votre capacité d'épargne mensuelle incluant votre épargne programmée actuelle ? _____ €

Objectifs de placement

A) Quels sont vos principaux objectifs d'investissement ?

- ☐ Aucun
- ☐ Constituer une épargne de précaution
- ☐ Préparer un projet immobilier horizon : _____ an(s)
- ☐ Obtenir un complément de revenus
- ☐ Préparer votre retraite horizon : _____ an(s)
- ☐ Valoriser votre capital
 - ☐ moins de 5 ans
 - ☐ 5 ans à 10 ans
 - ☐ 10 ans et plus
- ☐ Préparer la transmission de votre patrimoine

B) En règle générale, quelle affirmation vous correspond le mieux ?

- ☐ Accepter une rémunération faible en ne prenant aucun risque sur le capital placé
- ☐ Rechercher une meilleure rémunération en acceptant un risque en capital
- ☐ Rechercher une performance élevée en acceptant une part de risque importante en capital

The MiFID questionnaire (4/5)

C) Quelle est votre expérience en matière de placements ?

- Savez-vous qu'un investissement en actions est fait pour rechercher une performance élevée en acceptant un risque en capital important ? ☐ OUI ☐ NON
- En avez-vous déjà acheté ou détenu ? ☐ OUI ☐ NON
- Savez-vous que les obligations comportent un risque en capital en contrepartie d'une rémunération régulière ? (la valeur d'une obligation peut baisser si les taux d'intérêts augmentent) ☐ OUI ☐ NON
- En avez-vous déjà souscrit ? ☐ OUI ☐ NON
- Savez-vous que les actions cotées sur certains marchés (marché libre, Alternext, ...) peuvent subir des variations de cours importantes ou présenter des risques de liquidité qui pourraient accroître fortement le délai d'exécution de vos ordres ? ☐ OUI ☐ NON
- Savez-vous qu'il existe différents types d'ordre pour l'exécution de vos transactions en fonction des marchés ? ☐ OUI ☐ NON

	Connaissez-vous le niveau de risque associé à ces produits ?		En avez-vous déjà souscrit ?	
	Oui	Non	Oui	Non
Warrants, bons, droits et autres produits assimilés	☐	☐	☐	☐
Service à Règlement Différé	☐	☐	☐	☐
Obligations convertibles	☐	☐	☐	☐
Autres placements financiers (SCPI, FCPI...)	☐	☐	☐	☐

The MiFID questionnaire (5/5)

D) Si dans les mois à venir, la valeur de vos placements baissait de 15%, qu'auriez-vous plutôt tendance à faire ? :

- ☐ Tout vendre
- ☐ Vendre une partie de votre portefeuille
- ☐ Attendre que les valeurs remontent
- ☐ Profiter de la baisse pour investir à nouveau

Questionnaire remis au client le : _____

Si le client refuse de répondre aux questions A ou B ou D ou si le client répond NON à toutes les questions C relatives aux objectifs de placement, la réglementation en vigueur nous interdit de le conseiller sur ces opérations. L'ensemble de ses ordres sera effectué à sa propre initiative et il en assumera seul les conséquences financières qui pourraient en découler. Dans ce cas, cocher cette case et valider pour imprimer une décharge ☐



Chapter 2

MiFID questionnaire answers and stock market participation

(with M.-H. Broihanne)^a

Submitted to *International Review of Financial Analysis*

Abstract

The Markets in Financial Instruments Directive (MiFID) aims to strengthen the protection of European investors by requiring investment service providers to submit a questionnaire to their clients for completion. In this paper, we combine the MiFID questionnaire answers and banking records of more than 70,000 retail clients in France. We demonstrate that MiFID indicators, i.e. self-assessed risk tolerance and attitudes towards losses, explain stock investment decision, while controlling for many variables such as gender, age and income. MiFID indicators exhibit greater magnitude effects than those of classical determinants of stock investment. This paper also demonstrates that the investor's country of birth, residency and matrimonial regime and the holding of other risky financial products such as unit-linked life insurance and retirement plans are important drivers of stock market participation. Those findings still hold on retail clients who are familiar with either the MiFID questionnaire or with the stock market and for highly literate clients.

Keywords: Stock investment, MiFID questionnaire, risk tolerance, attitudes towards losses

JEL Classification: G02, G11, G28

(a) The authors thank Patrick Roger for his helpful comments and the participants at the 2017 Behavioural Finance Working Group Conference. They thank the seminar participants at the LaRGE Research Center and the Augustin Cournot Doctoral School in Strasbourg for their comments. They also thank OEE for financial support and AMF for their help in providing the data.

2.1 Introduction

Understanding the investment behavior of retail investors is important for asset pricing when investors make well-known errors such as under-diversification¹ and non-participation² in the financial and insurance markets. Numerous empirical works have examined the decisions made by retail investors and the consequences these decisions have on asset prices (e.g. Hirshleifer, 2001, Brown and Cliff, 2005 and Baker and Wurgler, 2006, 2007). For example, investor sentiment (Baker and Wurgler, 2007) drives asset pricing (Yang and Li, 2013, Blau, 2017 and Ryu et al., 2017) and is positively correlated with asset mispricing (Brown and Cliff, 2005 and Chang et al., 2015). Retail investor overconfidence (Daniel and Hirshleifer, 2015) or the disposition effect (Chang et al., 2016) also impact asset prices. However, classical asset pricing theories such as CAPM (Sharpe, 1964, Lintner, 1965 and Mossin, 1966), make the common assumption that investors are rational and risk averse. In empirical studies, a consistent methodology to assess attitudes towards risk is therefore necessary to understand the behavior of retail investors.

Attitudes towards risk are usually assessed through the use of hypothetical lottery choices (Holt and Laury, 2002 and Booij and van de Kuilen, 2009) or willingness-to-pay surveys (Cummings et al., 1986 and Mitchell and Carson, 1989), i.e. by concentrating on *revealed preferences*, or by using secondary data that reflect actual investment decisions (Barber and Odean, 2001), i.e. the study of *stated preferences*. Only a small number of empirical studies assess retail investors' attitudes towards risk by using a dedicated online questionnaire (Dorn and Huberman, 2005 and Hoffmann et al., 2013, 2015). These works combine assessed attitudes towards risk with brokerage records to study the trading activity of investors.

This paper uses an alternative approach by using the answers to the Markets in Financial Instruments Directive³ (MiFID) questionnaire to assess the attitudes of retail banking clients in France. This directive requires investment service providers to obtain a thorough knowledge of their clients through “the MiFID questionnaire”⁴ enabling them to offer advice and financial products that are perfectly suited to their situation and risk profile. This is not the central concern of the surveys/questionnaires examined in previous behavioral finance studies.

In this paper, the MiFID questionnaire answers of more than 70,000 retail clients of a large French retail bank were matched with their banking records to explain stock market participation. Stock

¹See Lease et al. (1974), Odean (1999), Mitton and Vorkink (2007), Kumar (2007) and Goetzmann and Kumar (2008).

²See Mankiw and Zeldes (1991) and Poterba and Samwick (1995).

³Implemented in 2007, the MiFID I (2004/39/EC) grouped together 31 member states of the European Economic area (28 European member states and 3 other states: Iceland, Norway and Liechtenstein). It replaces the Investment Services Directive (ISD), which was adopted in 1993. MiFID I aimed to improve the competitiveness of European financial markets and provide protection for individuals according to their level of financial knowledge. From January 2018, MiFID II (2014/65/UE) has replaced MiFID I (2004/39/EC), which we consider in this paper. MiFID II aims to reinforce the transparency and the efficiency of financial markets but also strengthen the protection of investors. Note that the MiFID questionnaire is only mandatory in European member states, and is not used in the US.

⁴As the directive does not impose a standard questionnaire, we use “the” MiFID questionnaire where “a” would be better suited. Actually, each bank is free to prepare and organize its own questionnaire.

market participation is widely documented in the literature (Peress, 2005, Bogan, 2008, Guiso et al., 2008, Grinblatt et al., 2011, Bonaparte and Kumar, 2013, Antoniou et al., 2015, Fischer and Jensen, 2015 and Cronqvist et al., 2016).

We show that MiFID questionnaire indicators exhibit a greater magnitude impact on stock market participation than all other variables. Retail clients with a high-risk tolerance level and those with low sensitivity to losses are shown to be more likely to hold stocks. We also reveal that risk tolerance has a greater impact on an investor's likelihood to hold stocks than his or her attitude towards losses. For example, exhibiting the highest risk tolerance increases the likelihood to hold stocks by 18.21%. In comparison, the other significant variables only increase this likelihood by around 1% to 4%. The only exception is the impact of patrimony indicators: holding other investment vehicles such as unit-linked (UL) life insurance (about 12%) and/or retirement plans (about 8%) has a strong impact on the decision to hold stocks. Among the other variables, we find that being native and living in the Paris region increase the likelihood to hold stocks, on average, by about 4% and 3.5%, respectively. Furthermore, retail clients opting for the matrimonial regime of *séparation des biens* (separation of property) are more likely to invest in stocks (about 2.5%). The same pattern is observed for self-employed retail clients (about 0.9%). Finally, for wealth and patrimony indicators, we find that retail clients who are constrained by high bank loans are less likely to own stocks (a 10% increase in the bank loan amount decreases the likelihood to hold stocks by 0.01%).

Our findings bring new insights into stock market participation for the four following reasons.

First, the use of MiFID questionnaire answers provides useful insights as retail clients must give relevant answers in order to get appropriate advice from their financial adviser. As questionnaire answers were matched with banking records, data reliability is better than in survey data.

Second, mandatory data collection through the MiFID questionnaire provides an opportunity to analyze a significant sample where male and female retail clients are equally represented. Our sample is representative of the French population in terms of socio-demographics and wealth level, including income and bank loans. Our results are therefore exempt of any selection bias and any stockholding differences between groups, for example men and women (Barber and Odean, 2001, Dwyer et al., 2002 and Agnew et al., 2003), are controlled for other covariates in our data sample.

Third, this is the first paper to combine declared information with real investment decisions for the study of stock market participation. Indeed, Hong et al. (2004), Fan and Xiao (2006), Balloch et al. (2014), Georgarakos and Inderst (2014) and Liang and Guo (2015) only use surveys to identify stock market participation determinants. We introduce a variety of variables, some of which are rarely studied, like the country of birth and residency, or never yet studied, like the choice of matrimonial regime. Overall, we can compare the magnitude effects of these variables to those of classical variables that are considered as key drivers of investment decisions such as gender, age and income.

Finally, this is the first time that MiFID data have been used to explain stock market participation⁵. They have already been used to analyze the risk profile in Italy (Mazzoli and Marinelli, 2014), investor sentiment in Belgium (D'Hondt and Roger, 2017) and the relationship between subjective financial literacy and trading behavior in Belgium (Bellofatto et al., 2018). This study also contributes to existing literature on French retail investors, which has already addressed the disposition effect (Boolell-Gunesh et al. 2009, 2012), diversification (Broihanne et al., 2016), herding behavior (Merli and Roger, 2013), the market sentiment index (Roger, 2014), market performance (Magron 2012, 2014), the impact of retail investors on market volatility (Foucault et al., 2011), the influence of investor attention on stock market activity and trading (Aouadi et al., 2013), the relationship between financial literacy and portfolio rebalancing (Bianchi, 2018) and the phenomenon of overreaction and underreaction on stock market (Siwar, 2011). Stockholding in France has also been documented by Arrondel et al. (2015) who demonstrate the positive impact of basic financial literacy on stock market participation. While the data used in their paper comes from a household survey, our study is based on the stockholding listed on the banking records.

Our paper is organized as follows. Section 2.2 describes our datasets. Section 2.3 presents the empirical results. Section 2.4 describes the robustness checks. Section 2.5 concludes.

2.2 Data and descriptive statistics

In this study, we use two datasets provided by a large French retail bank. The first dataset (Dataset 1) contains the MiFID questionnaire answers of more than 70,000 retail clients over the period 2007-2015. The second dataset (Dataset 2) includes the banking records of these retail clients on the 07/31/2015. Our datasets therefore differ from those of studies using brokerage house data of retail investors in France (Boolell-Gunesh et al., 2009, 2012), in other European countries (Belgium (Bellofatto et al., 2018), Germany (Weber et al., 2013), Netherlands (Hoffmann et al., 2015) and the UK (Richards et al., 2017)) or in countries such as in China (Chen et al., 2007 and Feng and Seasholes, 2005, 2008) and the US (Barber and Odean, 2001 and Korniotis and Kumar, 2011).

A variety of variables is used throughout this study and presented in Table 2.2.1. We classify them into three panels: MiFID indicators (Panel A), socio-demographic indicators (Panel B) and wealth and patrimony indicators (Panel C). We exclude individuals aged under 18 years old from the analysis like in Bauer et al. (2009) and Hoffmann et al. (2013, 2015).

Table 2.2.2 displays descriptive statistics.

⁵Cumming et al. (2011) and Aitken et al. (2015) focus on MiFID and exchange trading rules.

In our sample, 11.05% of retail clients directly or indirectly⁶ hold stocks as of 07/31/2015⁷. Similarly, low stock market participation has already been documented in the US (Mankiw and Zeldes, 1991, Haliassos and Bertaut, 1995 and Poterba and Samwick, 1995), the UK (Attanasio et al., 2002) and France (Arrondel et al., 2015). Limited stock market participation may be explained by information costs (Mankiw and Zeldes, 1991), fixed participation costs (Vissing-Jorgensen, 2002), social interaction (Hong et al., 2004), the lack of financial awareness (Guiso and Jappelli, 2005), internet access (Bogan, 2008), the lack of trust (Guiso et al., 2008), IQ scores (Grinblatt et al., 2011), political preferences (Kaustia and Torstila, 2011), redistributive tax system (Fischer and Jensen, 2015) and stock market image (Dobni and Racine, 2015, 2016).

⁶In France, stocks are indirectly held *via* an “Equity Saving Plan” (*Plan Epargne en Actions* or *PEA* in French), which offers fiscal advantages to holders. Specifically, capital gains are tax free if the PEA account has been held for a period of 5 years or more. French specificities have been documented by Boolell-Gunesh et al. (2009). In our study, when stockholding is indirect, “Stocks” is attributed a value of 1 if the retail client holds at least one “active” PEA account as of 07/31/2015, i.e. the quantity of stocks held differs from zero, and is attributed a value of 0 in all other cases (if there is only cash in the saving plan, for example).

⁷According to SoFia survey of TNS Sofres, the number of individuals holding financial assets in France between 2009 and 2015 decreased from 18% to 11%, and the stockholding rate decreased from 15.9% to 8.1%.

Table 2.2.1 – Variable definitions

Variables	Definitions
Dependent variable	
Stocks	Dummy variable coded 1 if the client directly or indirectly holds stocks as of 07/31/2015 and 0 otherwise.
Independent variables	
Panel A: MiFID indicators	
Risk tolerance	Self-assessed risk tolerance: “As a general rule, which assertion best describes you?”. Proposals are ranked from 0 to 2: 0 (accepting lower remuneration by taking no risk on the invested capital), 1 (seeking better remuneration by taking a capital risk) and 2 (seeking high performance by accepting a significant part of capital risk).
Attitudes twd losses	Self-assessed attitudes towards losses: “If in the coming months, your investments value would decrease by 15%, what would you do?”. Proposals are ranked from 1 to 4: 1 (selling the entire portfolio), 2 (selling part of the portfolio), 3 (waiting until the portfolio value increases) and 4 (taking advantage of lower prices to invest again).
.....	
Panel B: Socio-demographic indicators	
Gender	Dummy variable coded 1 for males and 0 for females.
Age	Age of the client as of 07/31/2015 (in years).
Native	Dummy variable coded 1 if the client is a native of the country and 0 otherwise.
Paris	Dummy variable coded 1 if the client lives in and close to the Paris region and 0 otherwise.
Matrimonial	Dummy variable coded 1 if the client has chosen the separation of property matrimonial regime and 0 otherwise.
Self-employed	Dummy variable coded 1 if the client directly perceives his/her income from his/her own professional activity and 0 otherwise.
Salaried	Dummy variable coded 1 if the client has a wage or salary from an employer and 0 otherwise.
Retired	Dummy variable coded 1 if the client is retired and 0 otherwise.
No occupation	Dummy variable coded 1 if the client has no occupation (e.g. students or any professional activity) and 0 otherwise.
.....	
Panel C: Wealth and patrimony indicators	
Income	Net monthly income (in euros).
Bank loans	Outstanding bank loan balance (in euros).
UL life insurance	Dummy variable coded 1 if the client holds unit-linked life insurance products as of 07/31/2015 and 0 otherwise.
Retirement	Dummy variable coded 1 if the client holds retirement plans as of 07/31/2015 and 0 otherwise.

Table 2.2.1 describes all variables. Independent variables are classified into three panels: Panel A: MiFID indicators; Panel B: Socio-demographic indicators and Panel C: Wealth and patrimony indicators.

Table 2.2.2 – Descriptive statistics

	N	$\bar{X}$ / %	std	min	max
Retail clients	77,365	100%	-	-	-
Dependent variable					
Stocks	77,365	11.05%	-	-	-
Independent variables					
Panel A: MiFID indicators					
Risk tolerance	71,461	0.32	0.50	0	2
0		69.35%	-	-	-
1		28.90%	-	-	-
2		1.75%	-	-	-
Attitudes twd losses	71,745	2.71	0.78	1	4
1		14.29%	-	-	-
2		6.24%	-	-	-
3		73.93%	-	-	-
4		5.54%	-	-	-
.....					
Panel B: Socio-demographic indicators					
Gender	77,365	51.24%	-	-	-
Age	77,365	47.97	17.55	18	105
Native	77,365	84.59%	-	-	-
Paris	77,365	12.26%	-	-	-
Matrimonial	77,365	10.30%	-	-	-
Self-employed	77,365	12.61%	-	-	-
Salaried	77,365	55.36%	-	-	-
Retired	77,365	15.59%	-	-	-
No occupation	77,365	16.44%	-	-	-
.....					
Panel C: Wealth and patrimony indicators					
Income	77,365	2,418.07	2,192.97	0	10,000
		1.90	1.11	0	5
INCOME BRACKETS :	CODES :				
0	0	7.28% ⁽⁰⁾	-	-	-
<1,500	750	31.62% ⁽¹⁾	-	-	-
1,500-3,000	2,250	36.67% ⁽²⁾	-	-	-
3,000-5,000	4,000	15.32% ⁽³⁾	-	-	-
5,000-10,000	7,500	6.72% ⁽⁴⁾	-	-	-
>10,000	10,000	2.39% ⁽⁵⁾	-	-	-
Bank loans	77,365	28,668.91	38,960.65	0	100,000
		1.04	1.18	0	3
BANK LOAN BRACKETS :	CODES :				
0	0	50.08% ⁽⁰⁾	-	-	-
<10,000	5,000	13.51% ⁽¹⁾	-	-	-
10,000-100,000	55,000	18.70% ⁽²⁾	-	-	-
>100,000	100,000	17.71% ⁽³⁾	-	-	-
UL life insurance	77,365	16.83%	-	-	-
Retirement	77,365	1.37%	-	-	-

Table 2.2.2 presents the descriptive statistics of the variables in Panels A, B and C. The first column indicates variable names. For each variable, the second column reports the number of retail clients (N) for which the data is available. The third column reports the percentage (%) of retail clients for which the corresponding variable is equal to one for binary variables and the mean ($\bar{X}$) for continuous variables. For MiFID dummy variables, “Income” and “Bank loans”, we also provide the percentage corresponding to each of the modalities, indicated in parentheses and superscript. The fourth column reports the standard deviation (std). The fifth and sixth columns indicate minimum (min) and maximum (max) values.

2.2.1 MiFID questionnaire answers

The MiFID bank questionnaire includes six sections dealing with socio-demographics, income, patrimony, bank loans, savings capacity and investment goals. The investment goal section is composed of four subsections concerning the investor’s main investment goals, risk tolerance, experience with financial products and attitudes towards losses during a hypothetical downturn.

The questionnaire was administered to retail clients up to three times between 2007 and 2015⁸. The questionnaire was initially given to any retail client who subscribed to any financial instrument after 2007. The second questionnaire was administered three years after the first one. The third questionnaire was administered to retail clients on subscribing to any financial instrument after a second questionnaire or was completed three years after the second one. Answers provided by retail clients to whom the questionnaire was administered at least twice are stable over time⁹. For this reason, we focus solely on the most recent MiFID questionnaire answers of these retail clients. The most recent questionnaire answers are always extracted at the closest date prior to 07/31/2015, i.e. the date of the banking records extraction.

In the questionnaire, we pay attention to retail clients’ self-assessed risk tolerance (“Risk tolerance”) and attitudes towards losses (“Attitudes twd losses”). Risk tolerance corresponds to the level of risk that a retail client would accept and reveals in choosing his or her answer to the question “As a general rule, which assertion best describes you?”. Attitudes towards losses correspond to the behavior that a retail client would exhibit during a downturn and assessed by the question “If in the coming months, your investments value would decrease by 15%, what would you do?”¹⁰. These variables are the closest empirical proxies for the concepts of risk aversion and loss aversion¹¹ usually found in the decision-making literature. In the questionnaire, risk tolerance and attitudes towards losses were not reported by 7.63% and 7.26% of retail clients, respectively. Both variables have been shown to impact trading activity and portfolio composition. For example, Hoffmann et al. (2015) find that investors with higher levels of and upward revisions in risk tolerance are more likely to trade and hold riskier portfolios. Using household survey data, Dimmock and Kouwenberg (2010) find that higher loss aversion reduces the probability that an individual will participate in equity markets.

Looking at “Risk tolerance” (Table 2.2.2, Panel A), there are three modalities across which the risk tolerance level increases from the first to the last: (0) accepting lower remuneration by taking no risk

⁸The questionnaire was prepared by the bank and was identical over the period 2007-2015. It satisfies MiFID requirements and anti-money-laundering standards. Retail clients answered the questionnaire with a financial adviser of the bank. About 70% of them use their checking account, opened at the bank concerned, on a daily basis.

⁹We compute agreement rates for answers between two successive questionnaires and found that, on the average, 90.69% of retail clients report the same self-assessed attitudes over time.

¹⁰The percentage of loss was chosen by the bank and reflects the volatility of the stock market at the time the questionnaire was administered, which is around 15-20% on an annual basis. Bellofatto et al. (2018) use the MiFID questionnaire of a Belgian online bank to study a similar question in which the percentage of loss is 20%.

¹¹Tversky and Kahneman (1992) introduce the Cumulative Prospect Theory (CPT) to illustrate the asymmetry existing between gains and losses. In their experimental work, they estimate a loss aversion coefficient (λ) that allows the quantification of sensitivity to losses. When λ is above 1, individuals exhibit loss aversion. These authors show that individuals are 2.25 times more sensitive to losses than gains.

on the invested capital, (2) seeking better remuneration by taking a capital risk and (3) seeking high performance by accepting a significant part of capital risk. We notice that 69% of retail clients are not risk tolerant at all (modality 0). This large proportion may explain the low level of stock market participation. About 31% of retail clients consider themselves to be risk tolerant (modalities 1 and 2). Likewise, Hong et al. (2004) find that 32.53% of US households are risk tolerant in their sample¹².

As for “Attitudes toward losses”, there are four modalities across which the selling rate decreases from the first to the last: (1) selling the entire portfolio, (2) selling part of the portfolio, (3) waiting until the portfolio value increases and (4) taking advantage of lower prices to invest again. In our sample, a large number of retail clients (about 74%) would wait in the case of a downturn until their portfolio value increased. About 20% would sell the entire portfolio or a part thereof. Only 5.54% of retail clients would purchase additional financial securities during the downturn.

2.2.2 Banking records

In Panel B, we first highlight that men represent 51.24% of the sample. Gender parity is seldom observed in behavioral finance works. Indeed, male retail investors usually represent about 80% of retail investors’ samples (Boolell-Gunesh et al. (2009) in France, Bellofatto et al. (2018) in Belgium, Weber and Welfens (2007) in Germany, Bauer et al. (2009) in the Netherlands, Richards et al. (2017) in the UK, Grinblatt and Keloharju (2009)¹³ in Finland and Barber and Odean (2001) in the US). However, our sample is similar to that analyzed in East Asia (Feng and Seasholes, 2008) due to a high participation rate of Chinese women on financial markets compared to other countries (Chen et al., 2004 and Feng and Seasholes, 2005).

Previous research has identified gender differences in financial decision making. We assume that male retail clients are more likely to invest in stocks than their female counterparts. Indeed, women are less likely to participate in the stock market than men (Haliassos and Bertaut, 1995, van Rooij et al., 2011 and Almenberg and Dreber, 2015). They hold less risky assets (Riley and Chow, 1992, Hinz et al., 1997, Bernasek and Shwiff, 2001, Dwyer et al., 2002, Agnew et al., 2003, Charness and Gneezy, 2012 and Georgarakos and Inderst, 2014) and are less risk seeking (Powell and Ansic, 1997, Jianakoplos and Bernasek, 1998, Halek and Eisenhauer, 2001, Booij and van de Kuilen, 2009 and Booth and Nolen, 2012) than men. Women allocate a smaller percentage of their financial assets to stocks than to bonds (Bajtelsmit and VanDerhei, 1997 and Bajtelsmit et al., 1999). They have a more conservative approach as they consider financial markets as being riskier than men do (Jacobsen et al., 2014). Barber and Odean (2001) show that men trade stocks 45% more often than women.

On average, retail clients are 48 years old. Our sample is slightly older than that of Feng and Seasholes (2005) in China (about 35 years) and slightly younger than those of Hallahan et al. (2004)

¹²However, Hong et al. (2004) use a dummy variable indicating risk tolerance.

¹³Working on a dataset from Finland, Grinblatt and Keloharju (2009) focus solely on men because the dataset is provided via mandatory military service.

in Australia (the largest number of individuals belongs to the 51-60 years age bracket), Dhar and Zhu (2006) in the US (50 years) and van Rooij et al. (2012) in the Netherlands (about 51 years).

Working on the asset allocation decisions of US households, Ackert et al. (2002) show that age has an impact on the mix of risky assets. Indeed, young households prefer to invest more in stocks than in bonds. Guiso et al. (2008) indicate that the probability of direct participation in the stock market decreases with age. Bodie and Crane (1997) find that the proportion of risky assets held by individuals decreases with age. Bakshi and Chen (1994) show that risk aversion increases with age. Recently, Brooks et al. (2018) confirmed the negative relationship between age and risk tolerance by showing that risk tolerance declines at an increasing, albeit slow, rate with age.

However, the impact of age on individual investment decisions is not always clear-cut. Differences in findings may be attributed to the methodologies employed (laboratory experiments, surveys or portfolio holdings), sample characteristics (households, investors) and to whether age could be seen as a proxy for experience or not. For example, Shum and Faig (2006) study asset allocation of US households and show that the decision to own stocks is positively correlated with age. Their result is in line with that of Balloch et al. (2014). Wang and Hanna (1997) show that the proportion of net wealth invested in risky assets increases with age. Looking at the relationship between age and risk aversion, Grable (2000) finds that risk tolerance¹⁴ increases with age in a sample of faculty and staff working at a large university. Other studies indicate that the relationship between age and risk aversion is not linear. By deriving relative risk aversion indexes from actual asset allocations of the US population, Riley and Chow (1992) find a U-shaped relationship, i.e. risk aversion decreases with age then increases after 65 years old. By using a psychometrically validated survey, Faff et al. (2008) show that young and older individuals are more risk tolerant compared to those who are middle aged. For these reasons, it is interesting to test the impact of age on stockholding in our sample.

Two geographical criteria are analyzed. We know whether retail clients were born in the country ("Native") but also whether they are living in the Paris region ("Paris"). The second variable allows us to test the impact of the biggest region of the country, in economic and size terms, on stock investment decisions. In our sample, approximately 85% of retail clients were native who were born in France and 12% of them live in or close to the Paris region¹⁵. Like Osili and Paulson (2007) and Chatterjee (2009), we assume that natives are more likely to invest in stocks. The demographic breakdown is also analyzed by Tekçe and Yılmaz (2015) to explain the behavior of Turkish retail investors on the stock market. About half of the sample of Tekçe and Yılmaz (2015) live in the most developed region of Turkey, containing the biggest Turkish city, Istanbul, and about 17% of the sample live in the region where

¹⁴Faff et al. (2008) analyze the link between financial risk tolerance and risk aversion and show that they are strongly aligned, explaining decision-making under uncertainty.

¹⁵The Paris region (or *Île-de-France* in French) is an administrative region of France that concentrates around one-third of the national wealth, according to INSEE (the French national statistics bureau) in 2014. 11.6% of the French population were born in a foreign country (INSEE, 2014) and about 18.8% live in the Paris region (INSEE, 2015). Our sample therefore echoes the demography of France.

the capital, Ankara, is located. In our study, “Paris” includes these two specificities: first, the gross domestic product (GDP) per region of the Paris region places it as the highest economic performance of the whole country, and second, this region includes Paris, which is both the capital and the largest French city. Previously, Arrondel et al. (2010) found that households within Paris are more likely to invest in risky assets. We therefore expect retail clients living in or close to the capital to be more likely to hold stocks.

Matrimonial regime choice is introduced for the first time in this study. Matrimonial regime complements marital status and structures patrimony allocation rules between spouses during the marriage but also after its breakdown (for divorced or widowed individuals). Among the different French matrimonial regimes¹⁶, we are interested in the “separation of property” regime (“Matrimonial”), which implies no joint-ownership between spouses. Under this regime, each spouse is free to manage his or her own goods and is liable for any debt he or she incurred/incurs before and after the marriage. We therefore consider “Matrimonial” as a proxy for patrimony protection desirability of retail clients. In our sample, 10% of retail clients have chosen the separation regime¹⁷. We expect the presence of a separation regime to increase the likelihood of stock investment. We consider that, like marriage (Bertocchi et al., 2011), this regime is another kind of safe asset within a portfolio choice framework. Married couples are in fact more likely to invest in risky assets than single people (Agnew et al., 2003 and Bertocchi et al., 2011). Indeed, Agnew et al. (2003) analyze nearly 7,000 retirement accounts and find that stock allocation is higher among married investors than among their single counterparts. This finding is consistent with that of Grable (2000) who shows that married individuals are more risk tolerant. However, Grable and Joo (2004) later find evidence of the contrary in their analysis of a sample of faculty and staff from two large universities.

Several professional categories are available in Dataset 2. We group and recode them as 4 dummy variables: “Self-employed”, “Salaried”, “Retired” and “No occupation”. The distinction between self-employed and salaried has already been studied by MacCrimmon and Wehrung (1986) and Dorn and Sengmueller (2009)¹⁸. According to MacCrimmon and Wehrung (1986), individuals perceiving their incomes directly from their own activity are willing to take more risks than those having straight salary work or wage from an employer. They are therefore willing to choose riskier investments than salaried individuals do. In a similar vein, Georgarakos and Inderst (2014) show that the self-employed are more likely to own stocks than the employed. However, Heaton and Lucas (2000) show that although entrepreneurs do represent a significant part of stock holders, they invest less wealth in stocks than

¹⁶French matrimonial regimes are divided into two categories: community and separation regimes. Community regimes are based on the notion of common goods. Separation regimes exclude joint-ownership between spouses. In Europe, the community regime is the default option in some countries (e.g. Belgium, France, Italy and Luxembourg), whereas the separation regime is the default regime in others (e.g. Germany, England, and Greece). In the US, the legal matrimonial regime differs from one state to another.

¹⁷According to INSEE, 10% of married individuals had separation regime marriage contracts in 2010.

¹⁸Other studies use 3 categories, i.e. professional, non-professional and retired or non-employed categories (Dhar and Zhu, 2006 and Goetzmann and Kumar, 2008), or distinguish finance-related jobs from other activities (Grinblatt and Keloharju, 2009 and Fuertes et al., 2014).

other similarly wealthy households. For these reasons, testing the impact of financial independence on stockholding is interesting in our sample, where salaried make up more than half of the retail clients. About 13% of retail clients are self-employed. This proportion is similar to those indicated by Sung and Hanna (1996) and Dorn and Sengmueller (2009). In our sample, 15.59% of the retail clients are retired. Likewise, van Rooij et al. (2012) report that 18.4% of Dutch households in their study are retired. Finally, 16.44% of our sample have no professional activity.

In Panel C, we analyze the net monthly income of retail clients. Our approach differs from that of other studies. For example, Hong et al. (2004) use the value of all assets except for non-retirement stockholdings to measure wealth. Guiso et al. (2008) combine financial wealth and income. Dorn and Sengmueller (2009) use the total net worth including all financial assets and real estate. Cho (2014) assumes that wealth consists only of financial assets and housing wealth. In this paper, we do not focus on the entire wealth, including real estate and financial assets, but analyze all components of wealth separately, i.e. the net monthly income, bank loan amounts (including consumer and real estate loans), unit-linked life insurance and retirement plan holdings. Indeed, distinguishing income from the other wealth components makes it possible to obtain a detailed description of an individuals' financial situation (Kumar, 2009 and Grinblatt et al., 2011). In our sample, retail clients earn, on average, €2,418 per month¹⁹ and half of them have still bank loans to reimburse²⁰. To preserve a significant sample size, the net monthly income and total outstanding bank loan balance have been extracted from Dataset 1. The different incomes and bank loan brackets are noted in the questionnaire (see Table 2.2.2). They are attributed to numerical modalities. We use “monetary” codes that correspond to the midpoint values of income and bank loan brackets (the lower bound being used for the last bracket). This makes it possible to consider “Income” and “Bank loans” as continuous variables. Income and bank loans impact stock investment decisions. Shum and Faig (2006) find that the decision to own stocks is positively associated with financial net worth and labor income. Likewise, Agnew et al. (2003) find that equity allocations are higher among investors with higher incomes. Campbell (2006) finds that income and wealth have a strong positive impact on public equity participation. Barber and Odean (2001) indicate that individuals having a higher income are more prone to accept market risks. Grinblatt et al. (2011) show that Finish investors belonging to the highest income decile are much more likely to participate in the stock market than those in the other deciles. As for bank loans, Guiso et al. (1996), Fratantoni (1998) and Cardak and Wilkins (2009) show that bank loan-constrained households are less likely to hold risky assets. In a similar vein, investors who are less liquidity-constrained are more likely to invest in stocks (Guiso and Sodini, 2013). Borrowing constraints are responsible for the limited equity investment of young consumers (Constantinides et al., 2002). Furthermore, Becker and

¹⁹This amount is close to the average for the whole French population. The net monthly income reported by INSEE is approximately €2,250 (data from 2015).

²⁰According to INSEE, the proportion of indebted households is 45.7% and the average amount of indebtedness is €33,100 in 2015.

Shabani (2010) show that households with mortgage debt are less likely to hold stocks than households with no mortgage debt. We expect to find similar results.

Finally, we expect financial market experience to impact stock market participation like in Nicolosi et al. (2009). In our sample²¹, 16.83% of retail clients invest in unit-linked life insurance²², like in the US (Bricker et al., 2014). Arrondel et al. (2010) report a similar proportion by using survey data on French households. Only 1.37% of retail clients hold retirement plans²³ whereas about a half of US households hold such accounts (Bricker et al., 2014). The huge difference is explained by the different systems in France (pay-as-you-go) and in the US (defined benefit plans and defined contribution plans).

2.3 Empirical results

This study uses a binary logit model in which the decision to participate in the stock market is coded 1. Like Hong et al. (2004), Fan and Xiao (2006) and Kaustia and Torstila (2011), we do not focus on quantitative differences in stockholding like Korniotis and Kumar (2011) or on the share of financial wealth invested in stocks like Wachter and Yogo (2010), but only consider the decision to hold.

As risk tolerance and attitudes towards losses (Panel A) are correlated (Spearman rank correlation coefficient $r_{sp} = 0.25$ and significant at 1%)²⁴, we separately analyze them.

²¹In this study, we do not analyze bonds due to the weak proportion of bondholders (lower than 1%).

²²There are two types of life insurance contract in France: products in euros and unit-linked products. Products in euros do not generate any capital risk. Unit-linked life insurance products are investment vehicles allowing individuals to invest in different assets such as stocks, bonds or funds. Consequently, their evolution depends on the performance of the financial markets.

²³“Retirement” includes “Popular Retirement Savings Plan” (*Plan Epargne Retraite Populaire* or *PERP* in French) and “Retirement Savings Plan” (*Plan Epargne Retraite* or *PER* in French). Both are contracts in which the customer indirectly invests amounts on financial supports such as stocks, mutual funds, etc.

²⁴Appendix A details the binary association measures.

We implement the following 3 models:

- Model 1 only focuses on Panels B and C. This model only considers real data, i.e. banking data, to analyze stock market participation. Model 1 focuses on 77,365 retail clients.
- Model 2 focuses on Panels A (only “Risk tolerance”), B and C. Complementing Model 1, Model 2 considers the risk tolerance level of retail clients in order to assess stock market participation. Due to the absence of answers on risk tolerance from a number of respondents, Model 2 focuses on 71,461 retail clients.
- Model 3 focuses on Panels A (only “Attitudes twd losses”), B and C. This model implements the decision making of retail clients during a hypothetical downturn in order to explain stock market participation. Model 3 focuses on 71,745 retail clients due to missing answers on attitudes towards losses.

We check the presence of possible multicollinearity problem by using the condition index of Belsley et al. (1980) and the Variance Inflation Factor (VIF). We conclude we do not face such problem as our results respect the critical threshold of both methods²⁵. Average Marginal Effects (AMEs) are used for analyzing the magnitude effects.

Table 2.3.1 presents our findings. We first notice that almost all independent variables are statistically significant at reasonable significance levels and that implementing MiFID indicators (Models 2 and 3) within a basic model (Model 1) increases the quality of goodness-of-fit (see Appendix C for further explanation).

²⁵Looking at the three models, the largest condition index is 17.76, which is below the critical threshold of 30 and also satisfies the threshold of 20 indicated by Erkel-Rousse (1995). As for the VIF, Chatterjee et al. (2000) state that a VIF above 10 and/or a mean VIF greater than or equal to 2 indicate the presence of multicollinearity problem. In our empirical analysis, the largest VIF is 2.94 and the largest mean VIF is 1.54 (see Table 2.5.5 in Appendix B).

Table 2.3.1 – Stock market participation determinants

	Model 1		Model 2		Model 3	
	AMEs	std	AMEs	std	AMEs	std
Dependent variable						
Stocks						
Independent variables						
Panel A: MiFID indicators						
Risk tolerance						
0			(omitted)			
1			0.1000***	0.0022		
2			0.1821***	0.0053		
Attitudes twd losses						
1					-0.0817***	0.0049
2					-0.0215***	0.0048
3					(omitted)	
4					0.0633***	0.0037
.....						
Panel B: Socio-demographic indicators						
Gender	0.0146***	0.0021	0.0086***	0.0022	0.0127***	0.0023
Age	0.0037***	0.0001	0.0036***	0.0001	0.0038***	0.0001
Native	0.0454***	0.0033	0.0398***	0.0034	0.0444***	0.0035
Paris	0.0385***	0.0029	0.0368***	0.0030	0.0352***	0.0031
Matrimonial	0.0295***	0.0029	0.0224***	0.0030	0.0281***	0.0031
Self-employed	0.0091***	0.0031	0.0086***	0.0032	0.0096***	0.0033
Salaried	(omitted)		(omitted)		(omitted)	
Retired	-0.0215***	0.0033	-0.0189***	0.0034	-0.0216***	0.0035
No occupation	0.0118***	0.0039	0.0074*	0.0041	0.0119***	0.0042
.....						
Panel C: Wealth and patrimony indicators						
ln(Income)	0.0150***	0.0010	0.0087***	0.0010	0.0133***	0.0011
ln(Bank loans)	-0.0006***	0.0002	-0.0010***	0.0002	-0.0009***	0.0002
UL life insurance	0.1320***	0.0020	0.0985***	0.0022	0.1280***	0.0021
Retirement	0.0858***	0.0058	0.0737***	0.0059	0.0839***	0.0061
.....						
N	77,365		71,461		71,745	
LR Chi2	10,906.17		12,675.22		10,919.84	
Proba>chi2	0.0000		0.0000		0.0000	
Pseudo-R2	0.2028		0.2446		0.2102	
Log likelihood	-21,440.37		-19,576.17		-20,511.58	

Table 2.3.1 displays Binary Logistic Regression (BLR) results that aim to identify stock market participation determinants among the retail clients of a large European retail bank. The dependent variable "Stocks" indicates whether a retail client directly or indirectly held at least one stock (1) or not (0) as of 07/31/2015. Average marginal effects (AMEs) of independent variables are reported. Statistical significance levels are fixed at 1%, 5% and 10% and are denoted by ***, ** and * respectively.

Comparing Model 1 to Models 2 and 3, we highlight that MiFID indicators exhibit much greater magnitude effects than the usual drivers of investment decisions, such as gender, age and income (Barber and Odean, 2001, Korniotis and Kumar, 2011). In addition, AMEs increase with the ordinal ranking of MiFID indicators. First, we find that highly risk-tolerant retail clients are more likely to invest in stocks (on average by 18.21% in the higher risk tolerance level). Likewise, Hong et al. (2004) show that stock ownership is greater among risk tolerant households in the US. Hoffmann et al. (2015) find that Dutch retail investors with higher levels of risk tolerance and upward revisions thereof are more likely to trade. Looking at attitudes towards losses, we find that retail clients who are willing to hold further financial securities during a downturn are more likely to hold stocks. Indeed, in relation to the neutral position, AME is strongly negative for retail clients preferring to sell the entire portfolio (-8.17%) than those preferring to sell a part of the portfolio (-2.15%) and is strongly positive for those preferring to invest in further financial securities (6.33%). In other words, retail clients who are less sensitive towards losses during the downturn have a high tendency to own stocks. In a similar vein, Dimmock and Kouwenberg (2010) show that the probability of investing in equity markets is lower among US households with high loss aversion. Finally, the comparison of the magnitude effects of the two attitudes leads us to conclude that risk tolerance has a greater impact on the decision to hold stocks than sensitivity towards losses.

In Panel B, across all models, we find that men are more likely to participate in stock market than women, as reported in van Rooij et al. (2011) and Almenberg and Dreber (2015). Looking at AMEs, we find that being a man increases the likelihood to own stocks by an average 1.20%. Women therefore have a more conservative approach than men (Jacobsen et al., 2014). Older retail clients are more likely to invest in stocks (on average by 0.37%) than younger ones. This result is in line with Shum and Faig (2006). As for our specific variables, i.e. “Native”, “Paris” and “Matrimonial”, we show all three display greater AMEs than gender, age and professional occupations. We find that native-born retail clients are more likely to hold stocks (on average by 4.32%) and reveal that the country of birth in our study has a strong impact on stockholding likelihood, as reported in the US. Specifically, US immigrants hold fewer financial assets such as stocks and mutual funds than native investors do (Osili and Paulson, 2007, Chatterjee, 2009 and Luik and Steinhardt, 2016). As expected, geographic proximity with the capital region (“Paris”) enhances stock market participation (on average by 3.68%), a result in line with the findings of Arrondel et al. (2010). For the first time, we shed light on the contribution of matrimonial regime choice in understanding stockholding. Retail clients opting for the separation regime have a high tendency to hold stocks (on average by 2.67%). As there is no joint-ownership between spouses, any gain and loss generated by stockholding does not impact the wealth of the other spouse. That financial independence promotes stock market participation.

Regarding professional occupations²⁶, we find that self-employed retail clients are more likely to own stocks (on average by 0.91%) than salaried employees. This result is consistent with the matrimonial separation regime choice for financial independence. For salaried employees, financial constraint might limit stock market participation. Being retired decreases the likelihood to own stocks by an average 2.07% compared to salaried employees. Being professionally active on the labor market thus increases the tendency to participate in the stock market, as professional activity promotes social interactions. Recently, Fagereng et al. (2017) show that Norwegian households tend to reduce their portfolio share and exit the stock market around retirement, which is consistent with our findings. According to Hong et al. (2004), social households are more likely to invest in the stock market than non-social households. They argue that individuals are attracted by stock market participation when many of their peers already invest. As for “No occupation”, we find that retail clients with no professional activity are more likely to invest in stocks (on average by 1.04%) than salaried ones. This result is opposed to findings by Grinblatt et al. (2011), who find that unemployed individuals display a lower stock market participation rate than employed ones. For these non-occupied individuals, we cannot make inferences on their social interactions and the only remaining explanation is the free time that they can allocate to stock investment.

In Panel C, we find that a 10% increase in the net monthly income increases the likelihood to invest in stock market by an average 0.12%. Our result is consistent with that of Barber and Odean (2001), Arrondel et al. (2010) and Liang and Guo (2015). Indeed, retail clients with a high level of income can afford to own stocks and face some potential losses. For bank loans, we find that a 10% increase in the outstanding balance of bank loans amount decreases the likelihood to invest in stock market by an average 0.01%. Indeed, being constrained by bank loans limits financial investment opportunities. As for risky financial products, we find that holding unit-linked life insurance and/or retirement plans positively affects the decision to hold stocks. Specifically, the magnitude effects of both products are higher than those of income, whatever the model we focus on. The likelihood to hold stocks is, on average, 11.95% and 8.11% higher among retail clients holding unit-linked life insurance and retirement plans, respectively. These retail clients are therefore willing to accept a risk of loss in capital, as both products depend on the performance of financial markets. Further, they are more financially sophisticated due to their diversified portfolios (Boolell-Gunesh et al., 2009).

2.4 Robustness checks

In Section 2.4, we test the consistency of our findings by performing three robustness checks, named RC1, RC2 and RC3.

²⁶In all models, “Salaried” is the reference category because it concentrates the highest number of retail clients.

RC1 tests the impact of financial experience on the decision to own stocks. In Panel C, we introduce the “Account tenure” variable in order to measure how long (in years) an individual has been a retail client of the bank. It corresponds to the duration between the date of arrival of the client in the bank and the date of extraction of banking records, i.e. 07/31/2015. We therefore consider “Account tenure” to be a proxy of retail clients’ financial experience²⁷. On average, individuals have been clients of the bank for 14 years. This period is much longer than those reported by Dorn and Sengmueller (2009) and Hoffmann et al. (2015), i.e. 3 and 4 years, respectively. In RC1, “Age” is excluded due to its high correlation with “Account tenure” (Pearson correlation coefficient is 0.59).

RC2 tests whether stock market participation is impacted by the retail client’s familiarity with the MiFID questionnaire content by focusing on retail clients having answered the questionnaire three times (N=11,839). We expect that higher familiarity with the questionnaire to indicate a higher confidence in the questionnaire objective, i.e. investor protection and suitability of advice, and a greater familiarity with stock markets. As expected, the stock holding rate of this subsample is about 30%, i.e. three times higher than that of the whole sample. We then check whether our findings are valid on this specific subsample.

RC3 tests the impact of financial literacy on stock market participation. According to the literature, financial literacy increases the likelihood to invest in stock (van Rooij et al., 2011 and Mouna and Anis, 2017) and derivatives markets (Hsiao and Tsai, 2018). In Panel A, we introduce four variables extracted from the MiFID questionnaire answers. These “financial literacy variables” are coded 1 if retail clients declare they know the risk associated with stocks (“R_Stocks”), bonds (“R_Bonds”) or other financial products (“R_other” for unusual products such as warrants, deferred service settlements, convertible bonds or other financial investments), respectively. The last variable, “R_Markets”, is coded 1 if retail clients declare they understand the operation of financial markets. In our sample, about 61% of retail clients know the risk associated with stocks (N=71,880; std=0.49). 44% of retail clients know the risk associated with bonds (N=71,906; std=0.50). 20% of retail clients understand the functioning of financial markets (N=75,694; std=0.40). Only 17% of them know the risk associated with unusual financial products (N=50,411; std=0.37). We create four additional models because the four financial literacy variables are highly correlated and exclude “Risk tolerance” and “Attitudes twd losses” because of correlation problems with the financial literacy variables.

Robustness checks results are displayed in Table 2.4.1 (RC1 and RC2) and Table 2.4.2 (RC3).

²⁷By using the retail investors’ answers, Glaser and Weber (2007) and Merkle (2016) introduce the “Experience” variable to represent the length of time during which retail investors have been directly investing in the stock market.

Table 2.4.1 – RC1 and RC2 results

	RC1						RC2					
	Model 1		Model 2		Model 3		Model 1		Model 2		Model 3	
	AMEs	std	AMEs	std	AMEs	std	AMEs	std	AMEs	std	AMEs	std
Panel A: MiFID indicators												
Risk tolerance												
0			(omitted)						(omitted)			
1			0.0988***	0.0022					0.2033***	0.0077		
2			0.1817***	0.0052					0.3376***	0.0173		
Attitudes twd losses												
1					-0.0816***	0.0048					-0.1832***	0.0202
2					-0.0217***	0.0048					-0.0180	0.0172
3					(omitted)						(omitted)	
4					0.0603***	0.0037					0.1090***	0.0126
Panel B: Socio-demographic indicators												
Gender	0.0107***	0.0021	0.0050**	0.0022	0.0088***	0.0022	0.0176**	0.0080	0.0051	0.0077	0.0127	0.0080
Age							0.0065***	0.0003	0.0058***	0.0003	0.0064***	0.0003
Native	0.0290***	0.0033	0.0241***	0.0034	0.0276***	0.0035	0.0844***	0.0123	0.0727***	0.0118	0.0773***	0.0122
Paris	0.0345***	0.0029	0.0334***	0.0030	0.0315***	0.0031	0.0669***	0.0119	0.0687***	0.0115	0.0632***	0.0118
Matrimonial	0.0374***	0.0029	0.0300***	0.0030	0.0363***	0.0031	0.0596***	0.0113	0.0435***	0.0108	0.0543***	0.0112
Self-employed	0.0278***	0.0031	0.0266***	0.0032	0.0288***	0.0032	0.0286**	0.0120	0.0194*	0.0115	0.0244**	0.0119
Retired	0.0211***	0.0027	0.0227***	0.0028	0.0232***	0.0029	-0.0315***	0.0121	-0.0283**	0.0117	-0.0345***	0.0120
No occupation	0.0107***	0.0038	0.0070*	0.0040	0.0109***	0.0040	0.0165	0.0154	0.0041	0.0149	0.0145	0.0153
Salaried	(omitted)		(omitted)		(omitted)		(omitted)		(omitted)		(omitted)	
Panel C: Wealth and patrimony indicators												
ln(Income)	0.0198***	0.0010	0.0133***	0.0010	0.0183***	0.0011	0.0360***	0.0042	0.0231***	0.0037	0.0320***	0.0040
ln(Bank loans)	-0.0006***	0.0002	-0.0009***	0.0002	-0.0008***	0.0002	-0.0014*	0.0008	-0.0018**	0.0008	-0.0017**	0.0008
Account tenure	0.0039***	0.0001	0.0039***	0.0001	0.0040***	0.0001						
UL life insurance	0.1186***	0.0020	0.0861***	0.0022	0.1150***	0.0021	0.2039***	0.0069	0.1360***	0.0073	0.1901***	0.0070
Retirement	0.0777***	0.0057	0.0655***	0.0059	0.0757***	0.0060	0.1356***	0.0174	0.1089***	0.0167	0.1260***	0.0173
N	77,365		71,461		71,745		11,839		11,818		11,824	
LR Chi2	11,762.76		13,481.78		11,718.33		2,198.01		2,960.72		2,377.72	
Prob>Chi2	0.0000		0.0000		0.0000		0.0000		0.0000		0.0000	
Pseudo-R2	0.2187		0.2601		0.2256		0.1526		0.2058		0.1652	
Log likelihood	-21,012.08		-19,172.89		-20,112.34		-6,103.38		-5,712.89		-6,007.37	

Table 2.4.1 reports the results of robustness checks 1 and 2. Robustness check 1 (RC1) considers “Account tenure” instead of “Age” and focuses on the whole retail clients sample. Robustness check 2 (RC2) refers to a subsample of retail clients who have answered the MiFID questionnaire three times, and considers the same independent variables included in our empirical analyses. Statistical significance levels are fixed at 1%, 5% and 10% and are denoted by ***, ** and * respectively.

Table 2.4.2 – RC3 results

	RC3							
	Model 4		Model 5		Model 6		Model 7	
	AMEs	std	AMEs	std	AMEs	std	AMEs	std
Panel A: MiFID indicators								
R_Stocks	0.1227***	0.0035						
R_Bonds			0.0893***	0.0024				
R_Markets					0.0793***	0.0021		
R_other							0.0868***	0.0034
Panel B: Socio-demographic indicators								
Gender	0.0142***	0.0022	0.0122***	0.0022	0.0119***	0.0021	0.0119***	0.0031
Age	0.0034***	0.0001	0.0034***	0.0001	0.0035***	0.0001	0.0044***	0.0001
Native	0.0350***	0.0035	0.0376***	0.0035	0.0404***	0.0033	0.0456***	0.0048
Paris	0.0334***	0.0031	0.0311***	0.0031	0.0344***	0.0029	0.0364***	0.0042
Matrimonial	0.0254***	0.0030	0.0232***	0.0030	0.0247***	0.0029	0.0284***	0.0041
Self-employed	0.0061*	0.0032	0.0073**	0.0032	0.0063**	0.0031	0.0087**	0.0044
Salaried	(omitted)		(omitted)		(omitted)		(omitted)	
Retired	-0.0190***	0.0035	-0.0199***	0.0035	-0.0213***	0.0033	-0.0211***	0.0047
No occupation	0.0149***	0.0042	0.0108***	0.0041	0.0093**	0.0039	0.0143**	0.0057
Panel C: Wealth and patrimony indicators								
ln(Income)	0.0091***	0.0010	0.0091***	0.0010	0.0104***	0.0010	0.0097***	0.0013
ln(Bank loans)	-0.0010***	0.0002	-0.0009***	0.0002	-0.0007***	0.0002	-0.0017***	0.0003
UL life insurance	0.1186***	0.0021	0.1225***	0.0021	0.1188***	0.0020	0.1555***	0.0028
Retirement	0.0800***	0.0060	0.0779***	0.0060	0.0775***	0.0058	0.1035***	0.0080
N	71,880		71,906		75,694		50,411	
LR Chi2	11,817.60		11,710.49		12,043.25		8,048.58	
Prob>Chi2	0.0000		0.0000		0.0000		0.0000	
Pseudo-R2	0.2273		0.2252		0.2261		0.1834	
Log likelihood	-20,087.64		-20,148.47		-20,609.89		-17,921.81	

Table 2.4.2 reports RC3 results. The four financial literacy variables from Panel A, i.e. “R_Stocks”, “R_Bonds”, “R_Markets” and “R_other”, are considered separately in RC3 and are added to Model 4, Model 5, Model 6 and Model 7, respectively. Statistical significance levels are fixed at 1%, 5% and 10% and are denoted by ***, ** and * respectively.

In RC1, we find that retail clients with high account tenure, i.e. financial experience, are more likely to invest in stocks. Furthermore, “Account tenure” is significant at all reasonable levels and displays AMEs close to those of “Age” (Table 2.3.1). As a result, we conclude that “Age” and “Account tenure” are two equivalent experience proxies. In a similar vein, Hoffmann et al. (2015) find that older and more experienced investors are more likely to trade derivatives. Our results are different from those of Korniotis and Kumar (2011) who showed that introducing both age and experience make it possible to distinguish two confounding effects where the negative effects of age dominate the positive effects of experience. For these authors, age indicates cognitive aging, i.e. the weakening of memory with age, whereas experience refers to the accumulation of greater investment knowledge with age. These interesting effects are not detected in our data.

In RC2, the AMEs of almost all the independent variables are greater than those of the whole sample. However, “Attitudes twd losses” coded 2, “Gender” and “No occupation” (Models 2 and 3) are not significant. As RC2 reinforces our findings, we conclude that administering the MiFID questionnaire to investors several times is useful for threefold reasons. First, in the third questionnaire, retail clients are more familiar and confident with the MiFID questionnaire. Confidence may explain the decrease of the number of unreported answers between two successive questionnaires to a great extent²⁸. Second, this opportunity for investment service providers to collect further information about clients makes them more likely to offer suitable advice and financial products. Finally, administering the MiFID questionnaire several times may also the financial trading activity of retail clients²⁹.

In RC3, we notice that financial literacy variables are significant at all reasonable levels. The likelihood to hold stocks is 12.27%, 8.93% and 8.68% higher among retail clients who know the risk associated with stocks, bonds and other financial products, respectively. It is 7.93% higher among retail clients who understand the functioning of financial markets. Financial literacy therefore has a positive impact on stock market participation. Moreover, all independent variables of Panels B and C have an identical impact, whatever the financial literacy variable introduced. As the impact of age is the same in the four models relative to our main findings, we conclude that age, i.e. experience, completes financial literacy. RC3 therefore helps to distinguish the positive impacts of financial literacy and experience in explaining stock market participation. Finally, implementing financial literacy variables increases the pseudo- R^2 value, except in “R_other” (Model 7). As financial literacy variables are extracted from the MiFID questionnaire answers, we again provide evidence of the contribution of MiFID variable use to explain stock market participation.

²⁸There are, on average, 8.29% of unanswered answers in the first questionnaire, 1.48% in the second questionnaire and 0.15% in the third questionnaire.

²⁹For example, a retail client who does not know what a stock is in the first questionnaire may attempt to obtain information about it.

2.5 Conclusion

The Markets in Financial Instrument Directive (MiFID) requires investment service providers to obtain a thorough knowledge of their clients through the use of a questionnaire, called the *MiFID questionnaire*, in order to offer clients advice and financial products that are perfectly suited to their situation. This paper analyzes the stock market participation of more than 70,000 retail clients of a large European retail bank by using two datasets drawn from MiFID questionnaire answers and banking records, respectively. We find that the likelihood to invest in stocks increases with risk tolerance and low sensitivity to losses. These self-assessed attitudes display greater magnitude effects than the usual drivers of investment decisions, such as gender, age and income. Our results also reveal that the country of birth and residency and the choice of matrimonial regime also have a strong impact on the decision to hold stocks. The likelihood to invest in stocks is higher among natives and those living in the biggest region of the country. The choice of a matrimonial separation regime demonstrates the will to be financially independent, which promotes stock market participation. Regarding wealth and patrimony indicators, we find that the propensity to own stocks is increased more by holding other risky financial products than by income. Finally, we confirm these findings on a specific subsample composed of retail clients who are familiar with either the MiFID questionnaire content or with the stock market. We also show that highly literate individuals are more likely to participate on the stock market than those with low literacy levels.

Our results contribute to the current debate between professionals, regulators and academics about the usefulness of MiFID indicators. de Palma and Picard (2011) carried out a first diagnosis of 14 MiFID questionnaires provided by 10 financial intermediaries in France. They suggested that a quantitative measurement of risk-taking preferences is necessary to ensure that investment service providers provide their clients with suitable advice and financial products. Our results reveal that this target has now been partly achieved, as the preferences assessed in the MiFID questionnaire explain stock market participation.

Furthermore, the findings of this paper can be used to improve the MiFID questionnaire. We encourage the developers of MiFID questionnaires to focus primarily on the retail clients' own preferences, as our study demonstrates that these preferences are key drivers of stock investment decision. As there is no regulatory constraint on the MiFID questionnaire content, any questions dealing with individual characteristics (e.g. gender, age and marital status) are generally located at the beginning of the questionnaire, whereas the more important information (risk tolerance and attitudes towards losses) is requested at the end of the document. The time respondents take to provide information that is already recorded in the bank database may lead them to be less attentive to the more interesting issues covered toward the end of the document. Although each question may provide additional information about retail clients, those developing the questionnaire should not underestimate the fatigue

effect or mistrust of those completing it, and should also bear in mind that the likelihood of getting high data reliability decreases with questionnaire length. Questionnaire length may also influence the number of unreported answers, potentially restricting the ability of investment service providers to offer their clients suitable advice and financial products. For these reasons, we suggest reducing the length of the questionnaire.

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Appendix

A - Measures of association between variables

We study the relationships between variables, as defined in Table 2.2.1. This preliminary step is necessary to create reliable estimation models. We use 4 appropriate measures to analyze associations between variables: Phi coefficient (ϕ), Cramer's V (V)³⁰, point-biserial correlation coefficient (r_{pb}) and Spearman's rank correlation coefficient (r_{sp}).

We use the Phi coefficient to study the association between binary variables, Cramer's V for nominal variables (at least one of which has more than two modalities), the point-biserial correlation coefficient for binary/continuous variables and Spearman's rank correlation coefficient for binary/ordinal and continuous/ordinal variables. Contrary to the other association measures, Spearman's rank correlation is a non-parametric measure that does not assume normal distribution and linear relationship between variables. It is used for variables with ordinal measurement.

These association measures are presented separately for a total of 71,188 retail clients for which data are available. We pay attention to binary associations having significant coefficients exceeding 0.20 in absolute value and carefully study the potential for multicollinearity issues between independent variables if coefficients exceed 0.50 (De Bourmont, 2012) in Section 2.3.

- *Phi coefficient*

Following Kremelberg (2011), we report the adjusted Phi value instead of Phi coefficient value due to unequal marginal distributions of binary variables³¹. Table 2.5.1 displays all binary pairwise variables.

³⁰Unlike the three binary association measures, Cramer's V coefficients are comprised between 0 and 1.

³¹The Phi coefficient value is equivalent to the Pearson correlation coefficient for binary variables. It represents the square root of chi-squared statistic divided by the sample size. However, it is assumed that each category approximately contains 50% of individuals. By violating this condition, the Phi coefficient maximum value may be below 1, thus leading to a misinterpretation of the strength of the binary association. To obtain an adjusted Phi value, we divided the Phi value by its maximum possible value. This maximum value is computed by using the following formula : $\frac{\sqrt{p_j - p_j p_i}}{\sqrt{p_i - p_i p_j}}$ where p_j is the row or column containing the lowest proportion and p_i is the row or column containing the second lowest proportion. This measure thus takes into account marginal distribution of each binary variable. Like the Pearson correlation coefficient, the upper bound of this adjusted value is fixed to 1.

Table 2.5.1 – Phi coefficients

	Gender	Native	Paris	Matrimonial	Stocks	UL life insurance	Retirement
Gender	1						
Native	0.05***	1					
Paris	0.03***	-0.21***	1				
Matrimonial	0.06***	0.01***	0.05***	1			
Stocks	0.05***	0.06***	0.05***	0.09***	1		
UL life insurance	0.02***	0.04***	0.03***	0.07***	0.41***	1	
Retirement	0.08**	0.03***	0.06***	0.06***	0.33***	0.50***	1

Table 2.5.1 presents the Phi coefficients for all binary variable pairs. A chi-squared test is used to assess coefficient significance. Statistical significance levels are set at 1% and 5% and are denoted by *** and **, respectively.

Table 2.5.1 shows that “Native” and “Paris” are negatively associated ($\phi=-0.21$). We also observe a strong association between risky financial products. We can hypothesize that the probability of stockholding increases with the probability of holding other financial products. Indeed, our main variable “Stocks” is positively associated with “UL life insurance” ($\phi=0.41$) and “Retirement” ($\phi=0.33$). In the same manner, “UL life insurance” and “Retirement” display a high Phi coefficient value ($\phi=0.50$). These relationships are consistent since all these financial products are risky investments.

- *Cramer’s V*

Cramer’s V makes it possible to assess relationships between professional occupations (“Occupations”) and binary variables. Results are displayed in Table 2.5.2.

Table 2.5.2 – Cramer’s V coefficients

	Occupations
Gender	0.18***
Native	0.03***
Paris	0.04***
Matrimonial	0.17***
Stocks	0.17***
UL life insurance	0.14***
Retirement	0.05***

Table 2.5.2 presents the Cramer’s V coefficients corresponding to each binary/nominal qualitative pairwise variables. A chi-squared test is used to assess coefficient significance. Statistical significance level is set at 1%, and is denoted by ***.

In Table 2.5.2, we note that there is no strong association between professional occupations and binary variables. Indeed, the highest values are 0.18 and 0.17, indicating that professional occupations are weakly associated with “Gender”, “Matrimonial” and “Stocks”.

- *Point biserial correlation coefficient*

This coefficient is computed for assessing relationships between age and binary variables. Results are reported in Table 2.5.3.

Table 2.5.3 – Point biserial correlation coefficients

	Age
Gender	-0.05***
Native	-0.03***
Paris	0.00
Matrimonial	0.10***
Stocks	0.26***
UL life insurance	0.22***
Retirement	0.03***

Table 2.5.3 displays the point-biserial correlation coefficients corresponding to each binary/continuous pairwise variables. A t-test is used to assess coefficient significance. Statistical significance level is set at 1% and is denoted by ***.

Table 2.5.3 indicates that age is positively correlated to “Stocks” ($r_{pb}=0.26$) and “UL life insurance” ($r_{pb}=0.22$), leading us to hypothesize that stockholding increases with age.

- *Spearman rank correlation coefficient*

This association measure is used to examine the relationship between ordinal qualitative variables (i.e. MiFID indicators, “Income” and “Bank loans”) and banking records, including our main variable “Stocks”. We note that “Bank loans” and “Income” are ordinal qualitative variables. For these two variables, we use their numerical modalities (indicated in parentheses and superscript in Table 2.2.2) instead of their monetary codes (see “CODES” in Table 2.2.2).

Table 2.5.4 – Spearman rank correlation coefficients

	Risk tolerance	Attitudes twd losses	Income	Bank loans
Risk tolerance	1			
Attitudes twd losses	0.25***	1		
Gender	0.07***	0.05***	0.16***	
Age	0.16***	0.06***	0.27***	
Native	0.06***	0.03***	0.06***	
Paris	0.02***	0.06***	0.08***	
Matrimonial	0.10***	0.06***	0.22***	
Income	0.24***	0.14***	1	
Bank loans	0.10***	0.08***	0.41***	1
Stocks	0.30***	0.13***	0.18***	-0.03***
UL life insurance	0.32***	0.12***	0.12***	-0.02***
Retirement	0.09***	0.05***	0.07***	0.04***

Table 2.5.4 displays the Spearman rank correlation coefficients corresponding to each binary/ordinal and ordinal/ordinal pairwise variable. A t-test is used to assess coefficient significance. Statistical significance level is set at 1% and is denoted by ***.

Table 2.5.4 shows that “Income” and “Bank loans” display a strong and positive association ($r_{sp}=0.41$), since banks only lend to clients whose income permits them to repay their debt. “Risk tolerance” is positively associated with “Stocks” ($r_{sp}=0.30$) and to “UL life insurance” ($r_{sp}=0.32$), both of which are risky financial products. “Age” and “Income” are also positively associated, reflecting wealth accumulation across time ($r_{sp}=0.27$). Furthermore, MiFID indicators are positively correlated with each

other ($r_{sp}=0.25$). “Risk tolerance” and “Income” also display a positive and unsurprising association ($r_{sp}=0.24$). No strong and significant association is found between “Attitudes twd losses” and banking records.

B - Variance Inflation Factor

Table 2.5.5 – Variance Inflation Factor (VIF)

	VIF		
	Model 1	Model 2	Model 3
	N=77,365	N=71,461	N=71,745
Panel A : MiFID indicators			
Risk tolerance			
0		(omitted)	
1		1.20	
2		1.03	
Attitudes twd losses			
1			1.05
2			1.02
3			(omitted)
4			1.03
.....			
Panel B : Socio-demographic indicators			
Gender	1.03	1.04	1.04
Age	2.94	2.88	2.88
Native	1.06	1.06	1.06
Paris	1.04	1.05	1.05
Matrimonial	1.07	1.07	1.07
Self-employed	1.15	1.14	1.14
Salaried	(omitted)	(omitted)	(omitted)
Retired	1.86	1.87	1.87
No occupation	2.30	2.22	2.23
.....			
Panel C : Wealth and patrimony indicators			
ln(Income)	2.60	2.54	2.53
ln(Bank loans)	1.37	1.36	1.36
UL life insurance	1.08	1.18	1.09
Retirement	1.03	1.03	1.03
.....			
Mean VIF	1.54	1.48	1.43

Table 2.5.5 reports VIF corresponding to independent variables. There is no multicollinearity, as all VIF values are below the critical threshold of 10 (Chatterjee et al., 2000).

C - Goodness-of-fit measures

We apply different measures to ensure the quality of goodness-of-fit of our BLR and their degrees of prediction. We begin by interpreting the statistical measures reported in Table 2.3.1 before conducting a thorough analysis.

Table 2.3.1 reports the chi-square likelihood ratio (noted LR Chi2). This numerical measure of fit enables us to compare the goodness-of-fit of each model to the intercept-only model, also called the “empty model”. This first test shows that our models provide better predictions than the empty model. We also report the p-value corresponding to each model. Whatever the model we focus on, the p-value is always equal to 0.00, leading us to conclude that the whole-model fit of our models is better than that of an empty model at all reasonable significance levels. Pseudo- R^2 also increases when MiFID variables are added to Model 1 (0.2028), leading to increased goodness-of-fit quality in Models 2 (0.2446) and 3 (0.2102). Indeed, the closer the pseudo- R^2 is to 1, the stronger the explanatory power of a model becomes. Furthermore, adding MiFID variables to Model 1 makes the log likelihood increase and converge to 0 in Models 2 and 3 meaning that we obtain a good model (Cahuzac and Bontemps, 2008).

Table 2.5.6 reports four additional statistical measures.

Table 2.5.6 – Goodness-of-fit measures

	Model 1	Model 2	Model 3
Goodness-of-fit Measures	N=77,365	N=71,461	N=71,745
AIC	42,906.74	39,182.34	41,055.16
BIC	43,027.08	39,319.99	41,202.06
Correct classification rate	89.23%	88.92%	88.66%
AUC	0.8186	0.8426	0.8215

Table 2.5.6 presents the results obtained from goodness-of-fit measures performed for each model in Table 2.3.1. We report “Akaike information criterion” (AIC), “Bayesian information criterion” (BIC), “Correct classification rate” and “Area Under the Curve” (AUC).

The selection criteria AIC and BIC of Models 2 and 3 are lower than those of Model 1. Therefore, the quality of Models 2 and 3 is higher than that of Model 1.

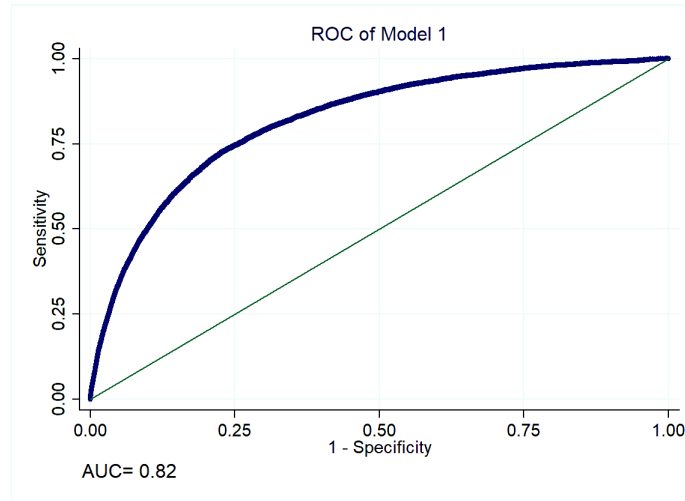
By comparing the concordances and discrepancies between estimated values and observed values, we determine the explanatory power of all models, i.e. the correct classification rate. Specifically, we analyze the sensitivity and specificity of our models. The terms sensitivity/specificity refer to the proportion of individuals who are correctly classified as positive/negative, respectively. In our case, “sensitivity” refers to the proportion of retail clients declared positive (i.e. stock holding) by the model and who are confirmed to be so by the observed values. “Specificity” refers to the probability of retail clients declared negative (non-stock holding) by the model and who are confirmed to be so by the observed values (i.e. they do not hold stock). To detect the correct classification rate, we must

therefore sum the correctly classified number of retail clients (positively and negatively) and divide it by the sample size. In our models, the correct classification rate is approximately 89%, meaning that estimated values and observed values tie at 89%.

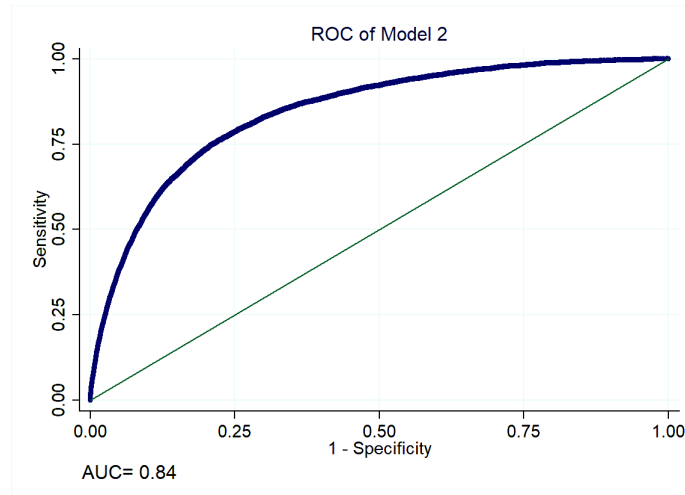
A graphical representation can also be created to assess the quality of a regression model. The ROC (Receiver Operating Characteristics) curve can be used to view the performance of a model because it represents the discriminatory quality of a model as a graph. In our study, we aim at distinguishing retail clients holding stock from those who do not hold stock. To perform a ROC curve, we need to compute the sensitivity and the specificity. Graphically, “1-specificity” is reported on the x-axis and “sensitivity” is reported on the y-axis. ROC curve provides a synthetic index, called Area Under the Curve (AUC). In our case, if AUC is equal to 1, then we can show that our model discriminates retail clients holding stock(s) from those who do not hold any stock in 100% of cases. This indicates a strong discrimination. However, if AUC equals 0.5, this means that the probability of discriminating both retail clients is 50%. Therefore, the model is not informative as it is equivalent to a random selection. Graphically, an AUC equal to 0.50 represents a bisector. As its name suggests, we focus on the area between the ROC curve and the bisector. The further we are from the bisector, the greater the discriminatory quality of a regression will be. To ensure that the model discriminates stock holding from non-stock holding, we should therefore obtain an AUC value close to 1. In Table 2.5.6, we note that the lowest AUC value is equal to 0.8186 (Model 1) and the highest is 0.8426 (Model 2). Graphical representation is reported in Figure 2.5.1. According to Long and Freese (2006), an AUC comprised between 0.80 and 0.90 indicates good discrimination. We can therefore conclude that all the models reported in this study correctly discriminate retail clients holding stock(s) from those who do not hold any stock during the sample period. Specifically, Models 2 and 3 display higher AUC values than that of Model 1, thus reinforcing the stockholding/non-stockholding discrimination.

Figure 2.5.1 – ROC and AUC

(a) Model 1



(b) Model 2



(c) Model 3

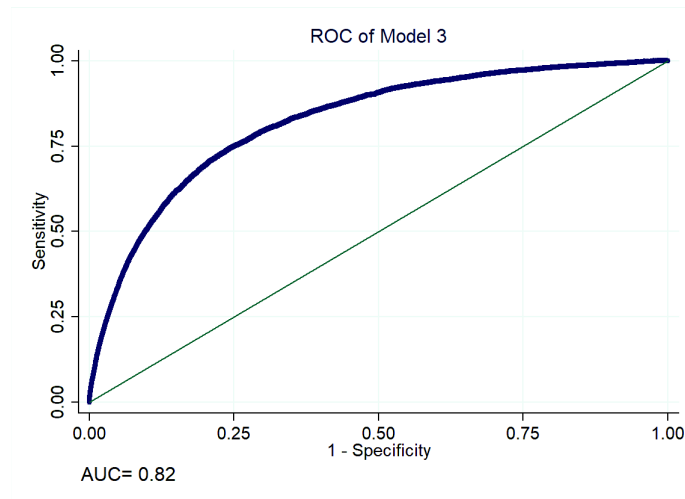


Figure 2.5.1 reports ROC and AUC corresponding to our models.

Chapter 3

Investment goals and mental accounting in French retail clients

(with M.-H. Broihanne)^a

Published in *Finance*, 2018, vol 39, p. 107-144

Abstract

Mental accounting is a cognitive process that guides individuals' personal financial decisions. Although well-documented, the investigation into how individuals form and select mental accounts, how these accounts evolve over time and are affected by environmental factors, has yet to be undertaken. In this paper, we identify how an external force, the MiFID questionnaire, may strengthen mental accounting. Based on a sample of more than 60,000 retail clients' questionnaire answers and banking records, we identify the determinants of the number of investment goals. We build a typology of retail clients' mental goals and show that the actual investment decisions of retail clients, fit their mental goals.

Keywords: Budgeting, mental accounting, MiFID questionnaire, investment goals

JEL Classification: G11, G20, G41

(a) The authors thank Patrick Roger for his insightful comments.

3.1 Introduction

Introduced by Thaler (1985), mental accounting is a set of cognitive operations used by individuals and households to organize, evaluate and keep track of financial activities (Thaler, 1999). Mental accounting is an anomaly to traditional economic theory because it violates the economic principle of fungibility (Shefrin and Thaler, 1988, Thaler, 1990, 1999 and Abeler and Marklein, 2017). Three components of mental accounting are defined (Thaler, 1999). The first component captures the different ways that outcomes are perceived and evaluated (Shefrin and Thaler, 1988, Shefrin and Statman, 2000, Rockenbach, 2004, Cheema and Soman, 2006, Helion and Gilovich, 2014 and Statman, 2014). The second component is funds categorization: individuals assign money to specific categories or mental accounts (Henderson and Peterson, 1992). The third component focuses on choice bracketing/budgeting (Read et al., 1999), i.e. mental accounts could be either narrowly or broadly balanced and are evaluated at different frequencies. Therefore, mental accounting is a cognitive process that guides individuals' personal financial decisions, such as spending, investment decisions and also portfolio composition (Alexander and Baptista, 2011, Baptista, 2012 and Alexander et al., 2017).

Although mental accounting is well-documented¹, an investigation into how individuals form and select mental accounts, how accounts evolve over time and, more importantly, how environmental factors support individuals to achieve their investment goals, has not yet been undertaken. In this paper, we fill this gap by studying the relationships that exist between investment goals, mental accounts and investment decisions. We aim to identify how some external forces (here the mandatory Markets in Financial Instrument Directive or MiFID questionnaire²) may strengthen the categorization of funds and align investment goals with investment decisions.

Knowing individual investment goals is an important issue. If investment advisers are fully aware of their clients' investment goals, they may help them to develop a discipline around savings and investment decisions. For example, Soman and Cheema (2011) find that a visual reminder of the savings goal (a picture of the household's children) and segregating savings into sealed envelopes, significantly increases the rate of savings. Other examples of investment servicing tools such as automatic deposits or using different labels for savings accounts, may contribute to a better matching between investment goals and investment decisions.

In this paper, investment goals are assessed through the MiFID questionnaire. Our data combines MiFID questionnaire answers of a large number of retail clients with their banking records. Therefore, our data provides the unique opportunity to directly observe investment goals and to compare them with the actual investment decisions made by retail clients. The use of MiFID questionnaire answers

¹See Zhang and Sussman (2018) for an extensive literature about mental accounting.

²Implemented in 2007, MiFID I (2004/39/EC) includes 31 member states of the European Economic area (28 European member states and three other states: Iceland, Norway and Liechtenstein). It replaces the Investment Services Directive (ISD) adopted in 1993. From January 2018, MiFID II (2014/65/UE) replaces MiFID I that we consider in our paper. MiFID II aims to strengthen the transparency, the efficiency of financial markets but also the protection of investors. The MiFID questionnaire does not differ between MiFID I and II and is only imposed on the MiFID member states.

is an alternative approach for analyzing mental accounting, whereas other studies use lab experiment choices (Heath, 1995 and Soman, 2001). Specifically, in the MiFID questionnaire, retail clients select their investment goals from a list provided by the bank. As response options are presented, however, an acquiescence phenomenon (Toppino and Brochin, 1989 and Roediger and Marsh, 2005) can bias the answers. Moreover, MiFID requires investment service providers to collect detailed information on retail clients in order to offer them advice and financial products suited to their financial situation. Therefore, retail clients are expected to give relevant and honest answers. Many studies have shown, however, that wording and/or framing have an impact on responses to survey decision problems (for example, Tversky and Kahneman, 1981). For these reasons, we investigate whether retail clients' actual investment decisions are consistent with the mental goals they assessed in their MiFID questionnaire. Moreover, if finding that this is true, we would be contributing to an academic justification for the use of the MiFID questionnaire.

In this study, we first derive a typology of retail client mental goals based on their investment goals. Here, we categorize self-assessed investment goals into mental goals, following the literature on funds categorization. It is important to get a quantitative picture of investment goals before deriving mental goals that, in turn, may drive investment decisions. For that reason, we then show that the number of self-assessed investment goals is determined by socio-demographics, wealth and patrimony indicators. Finally, we demonstrate that the actual investment decisions of retail clients are consistent with their mental goals, while controlling for the same indicators. Mental goals increase by approximately 10% to 20%, the likelihood of investing in the corresponding investment vehicles, whereas classical drivers of investment decisions such as gender, age and income, increase it by less than 1%. We also show that new variables, such as geographic origin and matrimonial regime choice, which are rarely or have not yet been studied, are also important drivers of investment decisions.

This paper is organized as follows. Section 3.2 documents the literature related to mental accounting and funds categorization. Section 3.3 describes our data. Section 3.4 presents the typology of retail client mental goals that we build from the assessed investment goals. Section 3.5 derives the determinants of the number of investment goals and presents our main empirical results on the relationships between mental goals and actual investment decisions. Section 3.6 is dedicated to robustness checks. Section 3.7 concludes.

3.2 Related literature

Several studies demonstrate that mental accounting influences individuals' wealth perception (Zhang and Sussman, 2018). Mental accounting is an important anomaly to traditional economic theories, which was introduced by Thaler (1985). He describes an example, which shows that after a winning bet of \$300, according to the life cycle theory (Modigliani and Brumberg, 1954 and Friedman, 1957),

an individual should save this amount for consumption in future years instead of using it for dining in a restaurant or for another additional expense. Mental accounting components violate the principle of fungibility (Shefrin and Thaler, 1988, Thaler, 1990, 1999 and Abeler and Marklein, 2017). According to this principle, the way wealth increases, either from a regular salary, savings revenues or winning bets, should have no effect on subsequent expenditure behavior. In practice, however, an increase in wealth is perceived and evaluated differently, and is then assigned to a specific account or category that could be narrowly or broadly balanced. In other words, mental accounting components are outcomes of perception and evaluation, funds categorization and choice bracketing/budgeting. In this paper, we focus on mental accounting as it relates to financial decision-making and, therefore, exclude consumption/spending decisions. Specifically, we present mental accounting components and examine how funds categorization influences savings and investment decisions.

The first component of mental accounting is the way money is perceived and evaluated. According to Thaler (1999), money is assigned to one of three levels. The first level is devoted to expenditures that are allocated into budgets, such as housing, food, etc. The second level corresponds to wealth that is allocated into accounts (checking, pension). The third level is represented by income that is divided into categories such as regular income or exceptional income.

The second component of mental accounting is funds categorization into mental accounts. Funds categorization is the cognitive process that eases financial decision-making and affects how people choose to spend and save their money³.

The third component of mental accounting is budgeting. Budgeting⁴ is defined as the process used to segregate and track the allocation and use of funds against different accounts with implicit or explicit spending limits or “budgets” (Galperti, 2017). Thaler (1985), Heath and Soll (1996) and Hastings and Shapiro (2013) note that households set budgets for various expenses (e.g. food budget or gas budget) and treat funds between the accounts tagged for each purpose, as distinct and imperfectly substitutable.

In this paper, we focus on the second component of mental accounting. We examine the relationships between investment goals, which are organized into mental goals, and actual investment decisions. By organizing information into groups based on commonalities, categorization can reduce the cognitive effort required to make decisions (Henderson and Peterson, 1992). For example, mental accounts may explain why any salary increase is set aside for the future or why people primarily use loans in order

³Soman and Ahn (2011) provide a review of mental accounting research in which the relationship between mental accounting and framing effects is documented.

⁴Mental budgeting has been analyzed in various specific contexts. In marketing, Stilley et al. (2010) examine the relationship between budgeting, promotions and spending behaviour. Brida and Tokarchuk (2015) study mental budgeting regarding tourists’ spending at a Christmas market in Merano (Italy). LaBarge and Stinson (2014) show that donors in the U.S. and Canada have mental budgets for philanthropy. Bao et al. (2015) introduce mental budgeting into travelers’ route choice and show that travelers with low or moderate travel budgets perceive there to be a higher cost than their actual cost on roads with tolls.

to be able to afford long-term and durable goods or why they choose illiquid savings accounts to limit the temptation to spend their money.

To study the categorization process involved in our data, we need to review the two funds categorization methods: i) categorizing the sources/origin and uses of funds and, ii) grouping a set of choices or outcomes together, i.e. bracketing (Read et al., 1999). We detail the first method, which is used in the paper to derive a typology of retail client mental goals. By focusing on the sources and uses of funds, Shefrin and Thaler (1988) and Thaler (1990, 1994 and 1999) document three categories: current assets (e.g. cash on hand or checking accounts), current wealth (e.g. liquid asset accounts such as savings accounts, stocks or mutual funds and home equity) and future income (e.g. retirement savings accounts).

Aligned with these considerations is the Behavioral Portfolio Theory (BPT) of Shefrin and Statman (2000), which depicts the investors' portfolio as a pyramid with multiple layers. Each layer, i.e. mental account, corresponds to a specific objective. The first layer of the pyramid includes risk-free investments, such as savings accounts, treasury bonds and monetary funds, for the purpose of preserving wealth level. Conversely, the top of the pyramid is devoted to risky investments, such as foreign stocks, options and high-risk securities, for the purpose of becoming richer. Therefore, the BPT refers to under-diversified portfolios, which are non-optimal, in contrast to the predictions of Markowitz's theory.

The identification of mental accounts has many implications for the study of households' savings and investment decisions. According to Thaler (1999), the sources and uses of money are categorized both in real and mental accounting systems. The impact of the number of savings goals in separate envelopes on savings behavior has been documented by Soman and Cheema (2011). They show that when funds earmarked as savings are presented in two savings accounts, the global savings amount is higher than when they are grouped in only one account⁵. Costs associated with transfer between accounts include both psychological costs and potential banking fees (Shefrin and Thaler, 1988). Yet, multiple savings accounts may enhance long-term savings behaviors (Thaler, 1999). Other academic studies have shown that setting savings goals is important in savings effectiveness (Hogarth and Anguelov, 2003 and Ülkümen and Cheema, 2011). Further, whether households have specific savings goals, this impacts savings behavior (Wärneryd, 1989, Zhong and Xiao, 1995, Wärneryd, 1999, Rha et al., 2006, Fisher and Montalto, 2010, Soman and Zhao, 2011 and Fisher and Anong, 2012), particularly if they are hierarchically ordered (Xiao and Noring, 1994, Canova et al., 2005 and Devaney et al., 2007). Moreover, household characteristics such as age, family size, income, gender, race, education, health and risk tolerance, have significant effects on savings and investment behaviors (Xiao and Anderson, 1997, Xiao and Fan, 2002 and Devaney et al., 2007).

⁵De Giorgi (2011) documents the relationship between loss aversion and multiple investment goals.

3.3 Data description

The data we use in this paper was provided by a large European retail bank. It consists of MiFID questionnaire answers and banking records of a sample of 68,190 retail clients during the period 2007-2015. In this bank, retail clients answered the MiFID questionnaire at least once (and at most, three times) during the period 2007-2015. The questionnaire was administered for the first time to any retail client who subscribed to any financial product after 2007. A second questionnaire was then completed three years after the first one. A third questionnaire was completed after having subscribed to any financial product after the second questionnaire, or, three years after the second one. In this paper, the most recent MiFID questionnaire answers are used for retail clients having completed it at least twice. Of the 68,190 retail clients, 37,458 completed only one questionnaire, 19,140 completed two and 11,592 completed three successive questionnaires. Note that the questionnaire was developed for, and focused on, retail clients by the bank and remained unchanged during the period 2007-2015. We observe that retail clients' answers are stable over time⁶. Moreover, for each MiFID question, the unreported answers rate decreases between two successive questionnaires. Therefore, taking the most recent questionnaire answers enables us to gather more useful data. Finally, we check for any sample selection bias by comparing retail clients' average net monthly income and bank loan amounts, over successive questionnaires (see Section 3.3.2).

The use of the MiFID questionnaire provides useful insights, as retail clients' financial decision-making is captured within the bank in the presence of a financial adviser and not online through survey participation (Crossley et al., 2017). According to Duffy et al. (2005), respondent fatigue leads to more noticeable consequences for online surveys. They argue that the absence of an interviewer does not encourage respondents to answer questions because respondents may often click down. A low response-rate may be mitigated, however, by high quality data obtained from online surveys (Evans and Mathur, 2005). In the context of the MiFID questionnaire, retail clients may give more honest answers, because they expect to get more tailored advice from their financial adviser.

For each retail client who held a current account within the bank, we match MiFID questionnaire answers at the date the questionnaire was administered, which is the closest to and occurred before 07/31/2015, to the banking records (extracted on 07/31/2015). Specifically, the MiFID questionnaire answers refer to retail clients' investment goals (defined in Table 3.3.1). As for the banking records (defined in Table 3.3.3), they refer both to socio-demographic indicators (Panel A) and to wealth and patrimony indicators (Panel B). Accounts of minors, i.e. those aged under 18 years old, are excluded as in Bauer et al. (2009) and Hoffmann et al. (2013, 2015).

⁶To check the answers' stability, agreement rates were calculated between two successive questionnaires. We find that, on average, 91.46% of retail clients made the same investment goal choice over time.

3.3.1 Investment goals

The MiFID questionnaire of the bank is composed of six sections dealing with: socio-demographic characteristics, income, patrimony, bank loans, savings capacity and investment goals, respectively. In this questionnaire, we focus on the subsection dealing with the main investment goals. Specifically, the bank asks retail clients to indicate their main investment goals. Seven proposals are given: building precautionary savings, preparing a real estate project, getting additional income, preparing for retirement, appreciating capital, preparing for patrimony transmission and no goal (Table 3.3.1). Retail clients have to choose at least one investment goal or none of them (“No goal”).

Table 3.3.1 – Investment goals

Variables	Definitions
Saving	Dummy variable coded 1 if the client aims to build precautionary savings and 0 otherwise.
Real estate project	Dummy variable coded 1 if the client aims to prepare a real estate project and 0 otherwise.
Additional income	Dummy variable coded 1 if the client aims to get additional income and 0 otherwise.
Preparing retirement	Dummy variable coded 1 if the client aims to prepare his/her retirement and 0 otherwise.
Capital appreciation	Dummy variable coded 1 if the client aims to appreciate his/her capital and 0 otherwise.
Patrimony transmission	Dummy variable coded 1 if the client aims to prepare his/her patrimony transmission and 0 otherwise.
No goal	Dummy variable coded 1 if the client has no investment goal and 0 otherwise.
Nber of goals	Number of investment goals chosen by the client (from 0 to 6).

Table 3.3.1 defines investment goal choices extracted from the MiFID questionnaire answers of 68,190 retail clients.

Assessing investment goals allows retail clients to project themselves into the future. Indeed, the main investment goals of retail clients may impact the decision to invest in bank savings accounts (Sub-panel B1) and in financial products (Sub-panel B2). Table 3.3.3 presents both Sub-panels.

Setting investment goals, however, is a cognitive process that should occur prior to making investment decisions. In the questionnaire answers, we cannot distinguish whether investment goals were assessed before or after investment decisions were made. Therefore, in this paper, we only look at the consistency between actual investment decisions and investment goals, which are organized into mental goals (defined in Section 3.4.1).

Table 3.3.2 displays descriptive statistics of investment goals. A large proportion of retail clients (58.41%) aim to build precautionary savings. Covering unexpected costs, this “primary” investment goal represents a safety mattress, which is typically the preferred investment type chosen by French retail clients, according to the French national statistics bureau (INSEE, 2015). A second reported goal (about 23% of retail clients) is capital appreciation. Precautionary savings and capital appreciation aim to preserve and increase wealth levels. They allow retail clients to prepare for both short-term and long-term expenditures. A third goal is preparing patrimony transmission, which represents 16.59% of retail clients’ goals. Patrimony transmission is a family concern involving long-term inheritance. The remaining investment goals are preparing a real estate project (13%) and preparing for retirement (12.62%). These are specific long-term investment goals. A small proportion of retail clients (6.36%)

wish to obtain additional income. Furthermore, we notice that retail clients have, on average, 1.30 investment goals and 18.49% of them declared that they have no investment goal.

Table 3.3.2 – Descriptive statistics of investment goals

Variables	%/ $\bar{X}$	std	min	max
Saving	58.41%	-	-	-
Real estate project	13%	-	-	-
Additional income	6.36%	-	-	-
Preparing retirement	12.62%	-	-	-
Capital appreciation	22.96%	-	-	-
Patrimony transmission	16.59%	-	-	-
No goal	18.49%	-	-	-
Nber of goals	1.30	0.94	0	6
Retail clients (N=68,190)	-	-	-	-

Table 3.3.2 displays descriptive statistics of investment goals. The first column reports variable names. The second column indicates the proportion (%) of retail clients for which the corresponding variable is coded 1 for binary variables and the mean ($\bar{X}$) for continuous variables. The third, fourth and fifth columns report the standard deviation, the minimum and maximum values respectively.

3.3.2 Banking records

Table 3.3.3 presents banking records, i.e. socio-demographic indicators (Panel A) and wealth and patrimony indicators (Panel B).

In Panel A, aside from classical variables such as gender and age, “Native” and “Paris” give a detailed insight into retail clients’ residency, which is rarely analyzed in the literature. Native-born retail clients (“Native”) are distinguished from those who were born in foreign countries. Retail clients living in the biggest city (“Paris”), in terms of economic activity and size, are distinguished from those living in other regions. Complementing marital status, matrimonial regime⁷ is included for the first time in our study. Specifically, matrimonial regime choice allows structuring wealth allocation between spouses before the marriage and after its breakdown. Among the different matrimonial regimes, we pay particular attention to the separation regime (also called “separation of property regime”). As its name suggests, the separation regime implies that there is no joint-ownership between spouses. So, any increase or decrease in the wealth level of a spouse does not impact the wealth level of the other spouse. This financial independence is considered as a proxy for patrimony protection needs. Finally, four socio-professional categories are identified: self-employed, salaried, retired and those exercising no professional activity.

⁷In France, two matrimonial regime categories exist: community and separation regimes. Community regimes focus on the notion of common goods, while the separation regime implies no joint-ownership between spouses. In Europe, the community regime is the default regime in some countries (e.g. Belgium, France, Italy and Luxembourg), whereas separator regime is applied by default in other countries (e.g. England, Germany and Greece). In the US, the legal matrimonial regime is different from one state to another one.

Panel B presents wealth components such as income and bank loans⁸. Income refers to the net monthly income of retail clients. Bank loans correspond to overall indebtedness including consumer and real estate loans. Two sub-panels are dedicated to studying investment in savings accounts (Sub-panel B1) and in financial products (Sub-panel B2). Similar to Shefrin and Statman (2000), we argue that a portfolio is designed as a “two-layered pyramid”. The low layer aims to preserve wealth by investing in risk-free accounts (Sub-panel B1) and the high layer aims to become richer by investing in financial markets (Sub-panel B2). In this paper, Sub-panel B1 refers to regulated savings accounts, standard savings accounts, home savings accounts and life insurance. Sub-panel B2 refers to stocks, mutual funds, warrants, bonds, unit-linked life insurance products and retirement plans. In each sub-panel, investment diversification is measured by “Nber of saving accounts” and “Nber of financial products”. We use Eurofidai and Bloomberg to complement this dataset by computing the market value of retail clients’ portfolios as of the 07/31/2015 and we document these values in Sub-panel B2.

⁸Due to a large number of missing banking records, the net monthly income and the bank loan amount have been extracted from the MiFID questionnaire answers. In the questionnaire, six net monthly income brackets (in euros) are reported: 0; lower than 1,500; between 1,500-3,000; between 3,000-5,000; between 5,000-10,000 and above 10,000. In the analysis, we use their midpoint values, i.e. 0; 750; 2,250; 4,000; 7,500 and 10,000 (the lower bound), respectively. The same process is applied for bank loans. Indeed, the questionnaire reports four bank loans brackets (in euros): 0, lower than 10,000; between 10,000-100,000 and above 100,000. We use their midpoint values, i.e. 0; 5,000; 55,000 and 100,000 (the lower bound), respectively.

Table 3.3.3 – Banking records

Variables	Definitions
Panel A: Socio – demographic indicators	
Gender	Dummy variable coded 1 for male clients and 0 for female clients.
Age	Age of the clients as of the 07/31/2015 (in years).
Native	Dummy variable coded 1 if the client is native of the country and 0 otherwise.
Paris	Dummy variable coded 1 if the client lives in and close to the biggest city of the country and 0 otherwise.
Matrimonial	Dummy variable coded 1 if the client is subject to the separation of property legal regime and 0 otherwise.
Self-employed	Dummy variable coded 1 if the client directly perceives his/her income from his/her own professional activity and 0 otherwise.
Salaried	Dummy variable coded 1 if the client has a wage or salary from an employer and 0 otherwise.
Retired	Dummy variable coded 1 if the client is retired and 0 otherwise.
No occupation	Dummy variable coded 1 if the client has no occupation (e.g. students and those having no professional activity) and 0 otherwise.
.....	
Panel B: Wealth and patrimony indicators	
Income	Net monthly income (in euros).
Bank loans	Loan amount remaining to be reimbursed (in euros).
Sub-panel B1: Savings accounts	
Regulated savings accounts	Dummy variable coded 1 if the client holds regulated savings accounts and 0 otherwise.
Standard savings accounts	Dummy variable coded 1 if the client holds standard savings accounts and 0 otherwise.
Home savings accounts	Dummy variable coded 1 if the client holds home savings accounts and 0 otherwise.
Life insurance	Dummy variable coded 1 if the client holds life insurance savings accounts and 0 otherwise.
Nber of savings accounts	Number of savings accounts held by the client as of the 07/31/2015 (from 0 to 7).
Sub-panel B2: Financial products	
Stocks	Dummy variable coded 1 if the client holds stocks and 0 otherwise.
Funds	Dummy variable coded 1 if the client holds mutual funds and 0 otherwise.
Warrants	Dummy variable coded 1 if the client holds warrants and 0 otherwise.
Bonds	Dummy variable coded 1 if the client holds bonds and 0 otherwise.
UL life insurance products	Dummy variable coded 1 if the client holds unit-linked life insurance products and 0 otherwise.
Retirement	Dummy variable coded 1 if the client holds retirement plans and 0 otherwise.
Nber of financial products	Number of different kinds of financial products held by the client as of the 07/31/2015 (from 0 to 6).
Portfolio value	Value of the investment assets of the client as of the 07/31/2015 (in euros).

Table 3.3.3 defines banking records variables of 68,190 retail clients.

Table 3.3.4 displays the descriptive statistics of banking records. In Panel A, we first shed light on the presence of gender parity. Men represent 50.82% of the sample, whereas this percentage is around 80% in European studies, such as in France (Boolell-Gunesh et al., 2009), Belgium (Bellofatto et al., 2018), Germany (Weber and Welfens, 2007), the Netherlands (Bauer et al., 2009), the UK (Richards et al., 2017), Italy (Guiso and Jappelli, 2005) and Finland (Grinblatt and Keloharju, 2009)⁹, and in US studies (Barber and Odean, 2001), the only exception being China where men represent about 50% (Feng and Seasholes, 2008). The average retail client is 49 years old. 85.50% of retail clients are

⁹Grinblatt and Keloharju (2009) study a specific sample containing only men enlisted into mandatory military service.

French native-born and 12.31% of them live in the Paris region. Looking at matrimonial regime choice, about 11% of retail clients are married under the separation of property regime. As for professional categories, the sample mainly consists of salaried employees (55.57%). By comparing our data on these socio-demographic variables with INSEE data, we find that our sample is representative of the whole French population.

Similarly, the representativeness of the sample is confirmed with regard to income and the residual amount of bank loans (Panel B). In our sample, the net monthly income and the bank loan amount remaining to be reimbursed are, on average, about €2,521 and €30,029 respectively¹⁰. We check for any sample selection bias by comparing average net monthly income and residual amount of bank loans in three groups of clients, according to the number of times they completed the questionnaire. We find that individuals who have been clients of the bank for a long time, completed successive questionnaires and have a net wealth that is slightly higher than that of new clients¹¹. Although wealth increases with time, this is due to a net monthly income increase of which, over the 2007-2015 period, is close to the inflation rate¹².

Analyzing Sub-panels B1 and B2, we define a classification criterion and argue that retail clients' perception differs between savings accounts and financial products.

Sub-panel B1 refers to four usual types of savings accounts. First, regulated savings accounts are deposit accounts, which are free of French income tax and social charges. They are limited to a maximum value (M) and pay a low interest rate (i) of about 1%¹³. Second, standard savings accounts are subject to taxes and social charges and they pay interest rates that are freely determined by banks¹⁴. These are: taxed savings accounts, term deposits and popular savings plans¹⁵. Third, home savings accounts are interest-earning bank accounts giving access to a subsidized mortgage. In France, there are two types of home savings accounts: *Compte Epargne Logement (CEL)* and *Plan Epargne Logement (PEL)*. They differ slightly in terms of: the down payment, the ceiling, remuneration rate and payment frequency. Life insurance accounts represent the fourth type of savings accounts. They primarily allow clients to set aside and invest money for retirement or other long-term projects. They also pay out in case of death before the end of the policy term. Two types of life insurance contracts

¹⁰According to INSEE, the net monthly income is about €2,225 (in 2014). As for bank loans, if we only consider indebted retail clients, the loan amount remaining to be reimbursed is, on average, €58,193. This amount is close to that communicated by INSEE, i.e. €61,900 (in 2010).

¹¹The average net monthly income is higher in the groups that completed three questionnaires (€2,962.24 for 11,592 clients, std=2,453.73) or two questionnaires (€2,565.09 for 19,140 clients, std=2,257.92) than in the group of clients who completed only one questionnaire (€2,361.31 for 37,458 clients, std=2,111.77) and the average bank loan amounts are comparable (€30,552.09, €29,519.85 and €29,182.19) for respectively one, two and three questionnaires (std are respectively 40,027.27, 38,812.06, 38,508.28).

¹²In Section 3.4, we check that regression coefficients are not affected if we use the first set of questionnaires instead of the last set.

¹³In France, regulated savings accounts are, for example, *Livret A* ($M = €22,950$ and $i = 0.75\%$), *Livret Bleu* ($M = €22,950$ and $i = 0.75\%$), *Livret de Développement Durable* or *LDD* ($M = €12,000$ and $i = 0.75\%$), *Livret d'Epargne Populaire* ($M = €7,700$ and $i = 1.25\%$) and *Livret Jeunes* ($M = €1,600$ and $i = 1.75\%$).

¹⁴There is no ceiling in such accounts.

¹⁵Since 2003, it was no longer possible to open a popular savings plan (*Plan Epargne Populaire* in French). Individuals who opened this account before 2003 could continue to make deposits.

exist: products in euros (Sub-panel B1) and unit-linked products (Sub-panel B2). Products in euros do not generate any capital risk¹⁶, whereas unit-linked products do, as these are investment vehicles allowing retail clients to invest in different asset classes such as stocks, bonds or funds. In France, life insurance mainly refers to life insurance for savings, i.e. products in euros. They offer a return that is generally higher than bank savings schemes and the right to make withdrawals during the life of the policy. Furthermore, they are an excellent tool promoting patrimony transmission due to their fiscal advantages, e.g. exemption from inheritance tax. On average, retail clients hold 1.34 different savings accounts. Reviewing empirical frequencies¹⁷, the most popular savings accounts are regulated savings accounts (58.73%), then life insurance (35.38%), followed by home savings accounts (23.44%) and standard savings accounts (13.03%).

Sub-panel B2 refers to six risky financial products. We first point out that financial markets participation rate is low, since the number of different kinds of risky financial products is, on average, lower than one (0.34). Focusing on empirical frequencies, the more diversified products like unit-linked life insurance products (17.13%) and mutual funds (9.52%) account for a larger number of retail clients. Further, stocks (5.41%), retirement plans (1.45%), bonds (0.73%) and warrants (0.18%) show low rates. We note that financial market participation is mainly indirect through insurance companies and mutual funds.

¹⁶Return is based on the government bonds that the insurer actually purchases when they invest clients' money.

¹⁷In Sub-panel B1, we only know if savings accounts were held by retail clients. The amount invested in the savings accounts is not available, unlike for Sub-panel B2.

Table 3.3.4 – Descriptive statistics of banking records

Variables	%/ $\bar{X}$	std	min	max
Panel A : Socio-demographic indicators				
Gender	50.82%	-	-	-
Age	49.14	17.55	18	105
Native	85.50%	-	-	-
Paris	12.31%	-	-	-
Matrimonial	10.90%	-	-	-
Self-employed	12.76%	-	-	-
Salaried	55.57%	-	-	-
Retired	16.93%	-	-	-
No occupation	14.74%	-	-	-
Panel B : Wealth and patrimony indicators				
Income	2,520.66	2,225.25	0	10,000
Bank loans	30,029.48	39,437.44	0	100,000
Sub-panel B1 : Savings accounts				
Regulated savings accounts	58.73%	-	-	-
Standard savings accounts	13.03%	-	-	-
Home savings accounts	23.44%	-	-	-
Life insurance	35.38%	-	-	-
Nber of savings accounts	1.34	1.19	0	6
Sub-panel B2 : Financial products				
Stocks	5.41%	-	-	-
Funds	9.52%	-	-	-
Warrants	0.18%	-	-	-
Bonds	0.73%	-	-	-
UL life insurance products	17.13%	-	-	-
Retirement	1.45%	-	-	-
Nber of financial products	0.34	0.70	0	5
Portfolio value	58,414.83	1.01e+07	0	2.60e+09
Retail clients (N=68,190)	100%	-	-	-

Table 3.3.4 displays descriptive statistics of banking record variables. The first column reports variable names. The second column indicates the proportion (%) of retail clients for which the corresponding variable is coded 1 for binary variables and the mean ($\bar{X}$) for continuous variables. The third, fourth and fifth columns report the standard deviation, the minimum and maximum values respectively. Note that “Income” and “Bank loans” are the only variables extracted from the MiFID questionnaire answers due to a large number of missing banking records (see footnote (8) for further information).

3.4 Analysis of mental goals

In Section 3.4, we derive a typology of retail clients’ mental goals from their investment goals. This typology is used to understand retail clients’ actual investment decisions in Section 3.5. Section 3.4.1 presents the retail client mental goals typology. Section 3.4.2 provides descriptive statistics on mental goals. Section 3.4.3 focuses on the relationship between the number of investment goals and income.

3.4.1 Retail client mental goals typology

In this sub-section, MiFID questionnaire investment goals choices are aggregated into mental goals that support funds categorization as described in the literature.

Funds categorization implies that individuals assign activities to specific accounts (Thaler, 1999). Shefrin and Thaler (1988) and Thaler (1990, 1994 and 1999) describe a hierarchy of money locations wherein the temptation to spend money decreases from the first category to the third one. Indeed, the first category, i.e. “current assets”, refers to cash on hand or checking accounts. The “current wealth” category refers to liquid asset accounts like savings accounts, stocks, bonds or mutual funds and home equity. Finally, the “future income” category refers to human capital and retirement savings accounts. In this paper, the study of investment goals enables us to focus on the two latter categories, i.e. “current wealth” and “future income”, as they both reflect financial planning. Therefore, according to the literature on funds categorization, the investment goals “Saving”, “Additional income”, “Capital appreciation” and “Patrimony transmission” can be classified into the “current wealth” category while “Real estate project” and “Preparing retirement” belong to the “future income” category.

The Behavioral Portfolio Theory of Shefrin and Statman (2000), however, allows us to refine investment goal categorization, and specifically that of the “current wealth” category. Indeed, these authors depict the investors’ portfolio as a pyramid with multiple layers. The first layer contains risk-free investments (e.g. savings accounts) for maintaining wealth levels, while the top of the pyramid refers to risky investments (e.g. foreign stocks or options) for becoming richer. On the basis of that representation, we distinguish “Saving” from the other investment goals of the “current wealth” category, i.e. “Additional income”, “Capital appreciation” and “Patrimony transmission”, as these latter goals are better achieved by financial markets participation.

For that reason, we derive a typology of retail client mental goals based on their investment goals. In line with previous findings, four mental goals (labeled G1, G2, G3 and G4) are created. The first mental goal (G1) refers to retail clients who aim to preserve their wealth level, i.e. those opting for “Saving”. G1 then illustrates wealth preservation. The second mental goal (G2) includes retail clients who aim to increase their wealth level, i.e. those opting for “Additional income”, “Capital appreciation” and/or “Patrimony transmission”. G2 then illustrates wealth accumulation. The third mental goal (G3) gathers retail clients who aim to realize specific long-term investments, i.e. those opting for “Real estate project” and/or “Preparing retirement”. We consider that G3 corresponds to “specific long-term investments”. Finally, the fourth mental goal (G4) is devoted to retail clients who have no investment goal (“No goal”).

In Section 3.5, we investigate whether this typology of mental goals is consistent with retail clients’ investment decisions. Specifically, we expect to find that G1 (wealth preservation) exhibits a high propensity to use saving accounts, G2 (wealth accumulation) exhibits a high propensity to hold savings accounts together with financial products and G3 (specific long-term investments) exhibits a high propensity to hold mainly financial products. For the control group G4 (no goal), negative or low propensities to hold investment vehicles are expected.

3.4.2 Retail client mental goals typology's descriptive statistics

Based on their declared investment goals, we match retail clients to the mental goals typology. Retail clients with multiple investment goals may fall into different mental goals within the typology. For example, a retail client who aims to build precautionary savings and to prepare his/her patrimony transmission belongs both to G1 and to G2.

In the mental goals typology, our retail clients are distributed according to the following proportions: G1 (wealth preservation) corresponds to 58.41% of the sample, G2 (wealth accumulation) to 34.91%, G3 (specific long-term investments) to 23.45% and G4 (no goal) to 18.49% of the sample. We also observe that retail clients differ, depending on the number of investment goals they chose. 45.77% of retail clients have a single investment goal and one quarter of retail clients chose two investment goals (Table 3.4.1). We note that saving is mostly represented in pairwise combinations (31.48%). Only 10.15% of the sample has three or more investment goals¹⁸. Likewise, in Lee and Hanna (2015), the number of goals chosen by respondents significantly decreases from three investment goals. This result is unsurprising because of the high number of investment goals in the questionnaire. Tversky (1964), Sidick et al. (1994), Rodriguez (2005) and Schneid et al. (2014) argue that three-option items are optimal for multiple-choice type tests.

3.4.3 Investment goals and income

We also focus our analysis on retail clients who reported in the MiFID questionnaire that they have no investment goal (G4). The lack of an investment goal can arise from two explanations. First, retail clients may not actually have an investment goal because they do not care about future financial planning. We classify these retail clients into the sub-group G4-1. Second, retail clients have investment goals, but they deliberately choose not to discuss how to develop them with their banker. Indeed, they may prefer not to justify their investment decisions by specifying an investment goal, since they consider it is personal information. These clients belong to the sub-group G4-2.

In order to empirically differentiate these two sub-groups, we look at the average net monthly income depending on the number of investment goals. Actually, we assume that G4-1 retail clients have insufficient income to allocate to any financial project, while G4-2 retail clients have (at least) one unreported goal because their income is higher. Table 3.4.1 shows the results for all goal numbers.

¹⁸As an illustration, hereafter we report the two highest numbers of retail clients having chosen three investment goals. 2.29% of retail clients aim to save, appreciate their capital and prepare their patrimony transmission. 1.14% of them aim to save, appreciate their capital and prepare their retirement.

Table 3.4.1 – Income analysis regarding the number of investment goals

Nber of goals	Average net monthly income	%
0	1,999.13	18.49%
1	2,354.11	45.77%
2	2,845.28	25.29%
3	3,283.92	8.56%
4	3,857.80	1.60%
5	3,940.91	0.24%
6	3,342.86	0.05%
Retail clients (N=68,190)		100%

Table 3.4.1 displays descriptive statistics on retail clients' income regarding the number of investment goals. The first column reports the number of investment goals. For each number of investment goals, the second and third columns report the average net monthly income (in euros) and the percentage of retail clients, respectively.

First, we point out that, on average, retail clients' net monthly income and the number of investment goal choices increase together (except for the lowest proportion of retail clients who checked all goals). This finding is in line with those of Chang (1994), Dynan et al. (2004), Rha et al. (2006) and Yuh and Hanna (2010). In order to distinguish retail clients unwilling to communicate their investments goals, we assume €2,354.11 as a threshold beyond which retail clients have a single non-reported investment goal. As a consequence, within G4, 18.27% of retail clients are classified into the sub-group G4-2. Conversely, 81.73% of them belong to G4-1, i.e. true no goal retail clients.

3.5 Investment decisions and mental goals

In Section 3.5, we analyze retail clients' actual investment decisions and their mental goals. Section 3.5.1 focuses on the determinants of the number of investment goals. Section 3.5.2 assesses the consistency between actual investment decisions and mental goals of retail clients.

3.5.1 The determinants of the number of investment goals

The impact of the number of goals on savings behavior has been documented by Soman and Zhao (2011). These authors demonstrate that having a single goal drives a higher rate of savings than those who have multiple goals, due to having to make trade-offs between competing goals. In this subsection, we aim to study the determinants of the number of investment goals. Note that the number of investment goals includes G4-2 retail clients for whom we assume they have one investment goal. We perform an ordinary least squares (OLS) regression, wherein the dependent variable is the number of investment goals ("Nber of goals") and independent variables¹⁹ are given in Table 3.3.3.

¹⁹Since savings account value is not available in the banking records, we only study the holding of savings accounts and financial products. Therefore, we exclude "Portfolio value".

Table 3.5.1 presents OLS results²⁰. Except for gender, all independent variables significantly influence the number of investment goals chosen by retail clients²¹.

In Panel A, we first notice that older retail clients are more likely to choose additional investment goals than younger ones. The impact of age on savings has been documented in the literature, although findings are not clear cut. Yuh and Hanna (2010) find that young households are more likely to save than their older counterparts, whereas Mirer (1979) and Chang (1994) find that savings behavior increases with age²². Interestingly, native-born retail clients and those opting for the separation regime are more likely to choose additional investment goals. Retail clients living in the capital region, however, are less likely to choose multiple investment goals. We argue that the high cost of living in the capital, may restrict the number of investment goals of these individuals.

Regarding professional categories, the number of investment goals is higher among the self-employed and salaried employees, whereas it is lower for the retired (compared to those exercising no professional activity). In a similar vein, Yuh and Hanna (2010) show that the propensity to save is higher among self-employed households than for other professional categories and is lower among retired households than in non-retired ones.

Panel B shows that income and bank loans have a positive impact on the number of investment goals. The impact of income is particularly strong whereas, for bank loans, it is much lower, as a situation of indebtedness limits the diversification of investment goal choices²³. Finally, the number of goals is higher among retail clients holding savings accounts and/or financial products²⁴. We point out that the coefficients of both sub-panels are greater than those of other variables. Therefore, actual investment decisions have a strong impact on investment goal diversification.

²⁰We first check the presence of possible correlation problems. The variables “Nber of savings accounts” and “Nber of financial products” are excluded since they are highly correlated with the savings accounts and financial products respectively (Pearson correlation coefficient being larger than 0.50). The typology groups are not included as they are obviously correlated with the number of investment goals. We also test the presence of the multicollinearity problem by using two methods. First, the condition index (or BKW indicator) of Belsley et al. (1980) is 18.77. Since it is below the critical threshold of 30, we conclude that this problem is not present in our study. We also respect the critical threshold of 20 suggested by Erkel-Rousse (1995). The strength of this method has been demonstrated by De Bourmont (2012). Second, we compute the Variance Inflation Factor (or VIF). According to Chatterjee et al. (2000), a VIF larger than 10 and/or a mean VIF larger than or equal to 2 denote the presence of multicollinearity problem. Satisfying both conditions (the largest VIF is 3.07 and the mean VIF is 1.66), the multicollinearity problem is not present on our study.

²¹Note that we get similar results when G4-2 retail clients are classified into the modality 0 of “Nber of goals”, except for “Gender” which is significant at 5% and “Matrimonial” which is no longer significant. Variable signs remain unchanged.

²²We point out that the impact of age on the number of savings goals and on the amount of savings, could be different.

²³We check for any sample selection bias by running the regression for the first set of questionnaires instead of the last set, i.e. the more recent one. As results are not different from the ones of Table 3.5.1, we conclude that the increase in net monthly income over time has a negligible impact on our findings.

²⁴We do not include warrants, bonds and retirements plans due to their low empirical frequencies (Table 3.3.4).

Table 3.5.1 – The determinants of the number of investment goals

	coef.	std
Dependent variable		
Nber of goals		
Independent variables		
Panel A: Socio-demographic indicators		
Gender	-0.0020	0.0065
Age	0.0010***	0.0003
Native	0.1011***	0.0093
Paris	-0.0226**	0.0099
Matrimonial	0.0324***	0.0105
Self-employed	0.0622***	0.0138
Salaried	0.0396***	0.0108
Retired	-0.0449***	0.0148
No occupation	(omitted)	
.....		
Panel B: Wealth and patrimony indicators		
ln(Income)	0.0714***	0.0020
ln(Bank loans)	0.0081***	0.0007
Sub-panel B1: Savings accounts		
Regulated savings accounts	0.1068***	0.0069
Standard savings accounts	0.0942***	0.0100
Home savings accounts	0.2449***	0.0081
Life insurance	0.3850***	0.0085
Sub-panel B2: Financial products		
Stocks	0.0611***	0.0154
Funds	0.1545***	0.0123
UL life insurance products	0.1463***	0.0101
_cons	0.3125***	0.0169
N	68,190	
F test	861.85	
Prob>F	0.0000	
R ²	0.1769	
Adjusted R ²	0.1767	

Table 3.5.1 displays OLS results that aim to identify the determinants of the number of investment goals. Note that the dependent variable takes into account G4-2 retail clients, i.e. those who did not report their investment goals, by assuming they have one investment goal. The first column reports variable names. The second and third columns display coefficients and standard deviations of the corresponding variables, respectively. The variable “No occupation” is the reference category among professional categories. Statistical significance levels are fixed at 1% and 5% that are represented by *** and ** respectively.

3.5.2 The impact of mental goals on investment decisions

In this sub-section, we aim to test the consistency between retail clients’ actual investment decisions and their mental goals (i.e. G1 to G4), while controlling for socio-demographic indicators and wealth and patrimony indicators.

We separately analyze mental goals (G1, G2, G3 and G4)²⁵, savings accounts (Sub-panel B1) and financial products (Sub-panel B2). In Sub-panel B1, we group regulated and standard savings accounts together in the variable “Classical savings accounts”. This grouping is justified by temporal bracketing (Thaler and Johnson, 1990): outcomes that are temporally proximate are more likely to be positioned in the same mental accounts²⁶. In Sub-panel B2, we exclude warrants, bonds and retirement plans due to the low proportion of ownership of these products (Table 3.3.4).

We perform binary logistic regressions (BLR), wherein the dependent variable is the decision whether to invest or not in savings accounts/financial products. We pay particularly attention as to whether or not these decisions fit with the mental goals²⁷. Average marginal effects (AMEs) are used for interpreting the magnitude effects.

Table 3.5.2 presents the results corresponding to savings accounts and Table 3.5.3 presents those corresponding to financial products.

Looking first at our typology of mental goals, we emphasize that all coefficients are statistically significant at all reasonable significance levels and display the highest AMEs. First, G1 retail clients are more likely to hold savings accounts than financial products, which is not surprising. Specifically, AME of classical savings accounts (10.76%) is higher than those of home (7.66%) and life insurance (2.24%) savings accounts. G2 retail clients are more likely to invest both in savings accounts and in financial products. We notice that the AME is significantly higher in life insurance holdings (26.73%) compared to classical (12.64%) and home (14.65%) savings accounts. This result is consistent with G2 retail clients’ goals since increasing wealth could better be achieved with life insurance. They also exhibit a greater preference for diversified products such as mutual funds (10.78%) and unit-linked life insurance products (16.26%). The same pattern is observed for G3 retail clients, who exhibit a high propensity to invest in home savings (11.44%) and in life insurance (14.71%) accounts. Both accounts fit these retail clients’ specific goals, i.e. preparing a real estate project (achieved by home savings account investments) and/or retirement (achieved by life insurance investments). Besides, looking at financial product holdings, we notice that AMEs of G3 are lower than those of G2, which is contrary to our expectations. We argue that investing in financial markets is better suited to retail clients wishing to accumulate further wealth than to those with long-term specific goals. As for G4 retail clients, AMEs are unsurprisingly negative and the lowest of all the models, thus, illustrating the absence of future financial planning. Indeed, they are specifically stronger and consistent for savings accounts since the latter are adapted to take into account the lowest-level needs (Xiao and Anderson, 1997). Overall, we demonstrate that retail clients’ investment decisions fit their mental goals. More importantly, we show

²⁵Typology groups are separately analyzed, as retail clients with multiple goals may belong to several groups.

²⁶As opposed to narrow bracketing, which promotes the separation of mental accounts. Moreover, grouping regulated and standard savings accounts together leads to a decrease of the log likelihood of the estimation.

²⁷The presence of the multicollinearity problem is tested. Analyzing all the BLR, we find that the maximum value taken by the condition index (Belsley et al., 1980) is 18.60. Being below the critical threshold and satisfying VIF criteria (the largest VIF is 3.03 and the largest mean VIF is 1.61), we conclude that the multicollinearity problem is not present in our study.

that mental goals are strong determinants of investment behavior.

In Panel A, we first notice that there is no gender difference in savings account holdings. In line with Riley and Chow (1992), Sundén and Surette (1998), Agnew et al. (2003) and Charness and Gneezy (2012), we find that male retail clients are more likely to participate in financial markets than their female counterparts. Older retail clients are more prone to invest in savings accounts and in financial products than younger ones (Mirer, 1979, Chang, 1994 and Shum and Faig, 2006). We also find that being native-born and/or living in the capital region increases the likelihood of holding savings accounts (except for classical accounts for which the coefficients are not significant) and financial products. Specifically, AMEs of “Native” are stronger than those of “Paris”. Likewise, Osili and Paulson (2007) and Chatterjee (2009) demonstrate that immigrants participate less in financial markets than natives in the US. As for the matrimonial regime, retail clients opting for the separation regime are less likely to hold classical and home savings accounts. Being financially independent from their spouse, they are more attracted by the possibility of receiving a high remuneration (via life insurance account holdings) and bearing capital risk (due to financial markets participation). Reviewing the professional categories²⁸, we find that salaried employees are more likely to hold savings accounts than the other professional categories. The retired are less likely to invest in financial markets than the salaried. This result is in line with that of Yuh and Hanna (2010). Finally, we find that financial independence, illustrated by “Matrimonial” and “Self-employed”, promotes financial markets participation.

In Panel B, we find that higher income levels make retail clients more likely to hold both savings accounts and financial products. Specifically, AMEs of financial products are higher than those of savings accounts. Therefore, retail clients with higher incomes are much more likely to hold financial products than savings accounts. As for bank loans, retail clients are less likely to hold both savings accounts and financial products, when the loan amount increases. Although AMEs are negative in both investments, we notice that retail clients are much less likely to hold financial products than savings accounts, when their loan amount increases.

²⁸ Among professional categories, “Salaried” is the reference category, as it contains the largest number of retail clients. Moreover, it is highly correlated with each of the other professional categories. Therefore, “Salaried” is the most appropriate reference for interpreting professional categories.

Table 3.5.2 – Savings account investment decisions

	Classical savings accounts				Home savings accounts				Life insurance			
G1	0.1076*** (0.0037)				0.0766*** (0.0034)				0.0224*** (0.0036)			
G2		0.1264*** (0.0041)				0.1465*** (0.0034)				0.2673*** (0.0028)		
G3			0.0964*** (0.0045)				0.1144*** (0.0036)				0.1471*** (0.0039)	
G4				-0.1709*** (0.0044)				-0.1941*** (0.0053)				-0.2794*** (0.0053)
.....												
Gender	0.0004 (0.0037)	-0.0034 (0.0037)	-0.0035 (0.0037)	-0.0007 (0.0037)	0.0014 (0.0033)	-0.0017 (0.0033)	-0.0019 (0.0033)	0.0011 (0.0033)	0.0003 (0.0036)	-0.0015 (0.0034)	-0.0014 (0.0035)	0.0025 (0.0035)
Age	0.0038*** (0.0001)	0.0022*** (0.0002)	0.0034*** (0.0001)	0.0031*** (0.0001)	0.0016*** (0.0001)	-0.0002 (0.0001)	0.0015*** (0.0001)	0.0011*** (0.0001)	0.0084*** (0.0001)	0.0055*** (0.0001)	0.0086*** (0.0001)	0.0081*** (0.0001)
Native	0.0750*** (0.0052)	0.0643*** (0.0052)	0.0723*** (0.0052)	0.0651*** (0.0052)	0.0656*** (0.0049)	0.0509*** (0.0049)	0.0616*** (0.0049)	0.0561*** (0.0049)	0.0737*** (0.0051)	0.0450*** (0.0048)	0.0691*** (0.0051)	0.0609*** (0.0050)
Paris	0.0076 (0.0057)	-0.0029 (0.0057)	-0.0044 (0.0057)	0.0025 (0.0056)	0.0411*** (0.0049)	0.0318*** (0.0048)	0.0299*** (0.0048)	0.0380*** (0.0048)	0.0519*** (0.0053)	0.0441*** (0.0050)	0.0436*** (0.0053)	0.0555*** (0.0052)
Matrimonial	-0.0384*** (0.0059)	-0.0549*** (0.0059)	-0.0475*** (0.0059)	-0.0450*** (0.0059)	-0.0074 (0.0054)	-0.0227*** (0.0053)	-0.0141*** (0.0054)	-0.0115** (0.0053)	0.0116** (0.0055)	-0.0074 (0.0052)	0.0095* (0.0054)	0.0133** (0.0054)
Self-employed	-0.1210*** (0.0056)	-0.1339*** (0.0055)	-0.1360*** (0.0056)	-0.1262*** (0.0055)	-0.0251*** (0.0053)	-0.0340*** (0.0052)	-0.0374*** (0.0053)	-0.0272*** (0.0052)	-0.0013 (0.0054)	-0.0072 (0.0051)	-0.0100* (0.0054)	0.0031 (0.0053)
Retired	-0.0192*** (0.0070)	-0.0264*** (0.0070)	-0.0023 (0.0070)	-0.0186*** (0.0070)	-0.0347*** (0.0058)	-0.0408*** (0.0058)	-0.0125** (0.0059)	-0.0340*** (0.0058)	-0.0306*** (0.0060)	-0.0404*** (0.0058)	-0.0048 (0.0060)	-0.0286*** (0.0059)
No occupation	-0.0141** (0.0061)	-0.0281*** (0.0061)	-0.0129** (0.0061)	-0.0163*** (0.0061)	-0.0055 (0.0055)	-0.0186*** (0.0054)	0.0016 (0.0055)	-0.0060 (0.0054)	-0.0035 (0.0061)	-0.0207*** (0.0058)	0.0089 (0.0061)	0.0000 (0.0060)
Salaried	(omitted)	(omitted)	(omitted)	(omitted)	(omitted)	(omitted)	(omitted)	(omitted)	(omitted)	(omitted)	(omitted)	(omitted)
.....												
ln(Income)	0.0099*** (0.0011)	0.0083*** (0.0011)	0.0087*** (0.0011)	0.0064*** (0.0011)	0.0081*** (0.0011)	0.0048*** (0.0010)	0.0055*** (0.0010)	0.0042*** (0.0011)	0.0111*** (0.0012)	0.0019*** (0.0011)	0.0071*** (0.0012)	0.0045*** (0.0012)
ln(Bank loans)	-0.0030*** (0.0004)	-0.0025*** (0.0004)	-0.0026*** (0.0004)	-0.0029*** (0.0004)	-0.0060*** (0.0003)	-0.0056*** (0.0003)	-0.0058*** (0.0003)	-0.0059*** (0.0003)	-0.0032*** (0.0004)	-0.0030*** (0.0003)	-0.0033*** (0.0004)	-0.0034*** (0.0003)
N	68,190	68,190	68,190	68,190	68,190	68,190	68,190	68,190	68,190	68,190	68,190	68,190
LR Chi2	2,902.35	2,991.88	2,543.27	3,466.86	1,258.81	2,497.70	1,671.16	2,335.53	7,553.60	13,686.50	8,819.02	10,599.85
Prob>chi2	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Pseudo-R2	0.0320	0.0330	0.0281	0.0383	0.0170	0.0336	0.0225	0.0315	0.0852	0.1544	0.0995	0.1196
Log likelihood	-43,852.74	-43,807.98	-44,032.28	-43,570.48	-36,500.62	-35,881.18	-36,294.44	-35,962.26	-40,530.46	-37,464.01	-39,897.75	-39,007.33

Table 3.5.2 reports the results of BLR, wherein the dependent variables are the savings account investment decisions of 68,190 retail clients as of the 07/31/2015. The Average Marginal Effects (AMEs) are reported for each independent variable. Standard deviations are indicated in parentheses. The variable “Salaried” represents the reference category among professional categories. Statistical significance levels are fixed at 1%, 5% and 10% and are denoted by ***, ** and * respectively.

Table 3.5.3 – Financial product investment decisions

	Stocks				Funds				UL life insurance products			
G1	-0.0241*** (0.0018)				-0.0225*** (0.0022)				-0.0058** (0.0029)			
G2		0.0576*** (0.0020)				0.1078*** (0.0025)				0.1626*** (0.0028)		
G3			0.0136*** (0.0021)				0.0393*** (0.0026)				0.0923*** (0.0032)	
G4				-0.0416*** (0.0031)				-0.0930*** (0.0043)				-0.1716*** (0.0053)
.....												
Gender	0.0188*** (0.0018)	0.0197*** (0.0018)	0.0192*** (0.0018)	0.0197*** (0.0018)	0.0057** (0.0023)	0.0066*** (0.0022)	0.0061*** (0.0023)	0.0072*** (0.0023)	0.0165*** (0.0029)	0.0162*** (0.0028)	0.0160*** (0.0029)	0.0182*** (0.0029)
Age	0.0024*** (0.0001)	0.0020*** (0.0001)	0.0026*** (0.0001)	0.0025*** (0.0001)	0.0036*** (0.0001)	0.0027*** (0.0001)	0.0039*** (0.0001)	0.0037*** (0.0001)	0.0040*** (0.0001)	0.0024*** (0.0001)	0.0043*** (0.0001)	0.0040*** (0.0001)
Native	0.0297*** (0.0028)	0.0250*** (0.0028)	0.0299*** (0.0028)	0.0287*** (0.0028)	0.0426*** (0.0036)	0.0330*** (0.0035)	0.0423*** (0.0036)	0.0398*** (0.0036)	0.0448*** (0.0044)	0.0285*** (0.0042)	0.0424*** (0.0043)	0.0382*** (0.0043)
Paris	0.0325*** (0.0022)	0.0354*** (0.0022)	0.0338*** (0.0022)	0.0355*** (0.0022)	0.0249*** (0.0031)	0.0275*** (0.0031)	0.0253*** (0.0031)	0.0290*** (0.0031)	0.0173*** (0.0043)	0.0156*** (0.0042)	0.0138*** (0.0043)	0.0211*** (0.0043)
Matrimonial	0.0188*** (0.0022)	0.0190*** (0.0022)	0.0207*** (0.0022)	0.0214*** (0.0022)	0.0226*** (0.0031)	0.0200*** (0.0030)	0.0245*** (0.0031)	0.0258*** (0.0031)	0.0149*** (0.0043)	0.0063 (0.0042)	0.0153*** (0.0043)	0.0175*** (0.0043)
Self-employed	0.0027 (0.0025)	0.0049* (0.0025)	0.0040 (0.0025)	0.0053** (0.0025)	0.0064* (0.0033)	0.0081** (0.0032)	0.0066** (0.0033)	0.0100*** (0.0033)	0.0007 (0.0044)	-0.0008 (0.0043)	-0.0032 (0.0044)	0.0047 (0.0043)
Retired	-0.0191*** (0.0027)	-0.0197*** (0.0026)	-0.0172*** (0.0027)	-0.0189*** (0.0027)	-0.0281*** (0.0035)	-0.0293*** (0.0034)	-0.0219*** (0.0035)	-0.0276*** (0.0035)	-0.0379*** (0.0048)	-0.0418*** (0.0046)	-0.0210*** (0.0048)	-0.0370*** (0.0048)
No occupation	0.0130*** (0.0032)	0.0119*** (0.0032)	0.0154*** (0.0032)	0.0144*** (0.0032)	-0.0017 (0.0043)	-0.0054 (0.0042)	0.0034 (0.0043)	0.0005 (0.0042)	-0.0185*** (0.0053)	-0.0273*** (0.0052)	-0.0088* (0.0053)	-0.0156*** (0.0053)
Salaried	(omitted)	(omitted)	(omitted)	(omitted)	(omitted)	(omitted)	(omitted)	(omitted)	(omitted)	(omitted)	(omitted)	(omitted)
.....												
ln(Income)	0.0128*** (0.0010)	0.0092*** (0.0009)	0.0132*** (0.0010)	0.0125*** (0.0010)	0.0166*** (0.0012)	0.0099*** (0.0010)	0.0156*** (0.0012)	0.0146*** (0.0012)	0.0111*** (0.0011)	0.0045*** (0.0010)	0.0083*** (0.0011)	0.0073*** (0.0011)
ln(Bank loans)	-0.0006*** (0.0002)	-0.0006*** (0.0002)	-0.0008*** (0.0002)	-0.0008*** (0.0002)	-0.0005** (0.0002)	-0.0004* (0.0002)	-0.0007*** (0.0002)	-0.0006*** (0.0002)	-0.0005 (0.0003)	-0.0004 (0.0003)	-0.0007** (0.0003)	-0.0007** (0.0003)
N	68,190	68,190	68,190	68,190	68,190	68,190	68,190	68,190	68,190	68,190	68,190	68,190
LR Chi2	3,652.30	4,451.71	3,496.72	3,687.04	4,103.82	6,188.49	4,216.87	4,636.38	2,669.91	5,768.46	3,438.66	4,037.06
Prob>chi2	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Pseudo-R2	0.1274	0.1552	0.1219	0.1286	0.0957	0.1444	0.0984	0.1081	0.0428	0.0924	0.0551	0.0646
Log likelihood	-12,513.23	-12,113.53	-12,591.02	-12,495.86	-19,383.66	-18,341.33	-19,327.14	-19,117.38	-29,890.59	-28,341.31	-29,506.21	-29,207.01

Table 3.5.3 reports the results of BLR, wherein the dependent variables are the financial product investment decisions of 68,190 retail clients as of the 07/31/2015. The Average Marginal Effects (AMEs) are reported for each independent variable. Standard deviations are indicated in parentheses. The variable “Salaried” represents the reference category among professional categories. Statistical significance levels are fixed at 1%, 5% and 10% and are denoted by ***, ** and * respectively.

3.6 Robustness checks

In Section 3.6, we perform three robustness checks of the determinants of the number of investment goals (Section 3.5.1):

- Robustness check 1 (RC1) evaluates whether the value of the portfolio influences the number of investment goals. We replace portfolio holdings, i.e. “Stocks”, “Funds” and “UL life insurance products”, with the whole investment asset value in order to test whether a quantitative measure of financial wealth has an impact on the main findings.
- Robustness check 2 (RC2) tests the impact of retail clients’ attitudes towards risk on the number of investment goals. According to Devaney et al. (2007), risk tolerance has an impact on the likelihood of movement from lower to higher savings levels. In the MiFID questionnaire, retail clients (N=64,086) self-assess their attitudes towards risk by choosing one out of three proposals, in which risk tolerance increases from the first to the third one. Looking at the distribution of retail clients, a large proportion of retail clients (about 68%) are not risk tolerant, whereas about 32% of them have a low or high, risk tolerance level. This result is similar to that of Hong et al. (2004)²⁹.
- Robustness check 3 (RC3) tests the impact of financial literacy on the number of investment goals. In the MiFID questionnaire, some retail clients (N=46,553) self-assess whether they understand the risks associated with stocks, bonds, and other particular financial products (such as warrants, differed service settlements, convertible bonds and other financial investments) and whether they understand financial markets (i.e. change of order execution delay and existence of different types of orders). Based upon these questions, we build a financial literacy score (“Financial literacy”) that ranges from 0 (no financial knowledge) to 4 (high level of knowledge). In our sample, the average score is about 1.98 (std=1.16).

Table 3.6.1 reports robustness checks results. In RC1, we find that the number of investment goals increases with portfolio value, while controlling for the whole wealth and patrimony indicators. Portfolio value’s coefficient is close to those of the continuous variables “Income” and “Bank loans”. Therefore, we reinforce our main findings. In RC2 and RC3, we exclude Panel B to check whether our findings are robust regarding qualitative analysis. We test whether both socio-demographic indicators³⁰ (Panel A) and individual characteristics (Panel C), i.e. risk tolerance and financial literacy, have an impact on the number of goals. Individual characteristics are separately analyzed to isolate their impact on the number of goals. In RC2, we find that risk tolerance level influences the number of investment goals. Retail clients who are not risk tolerant are much more likely to limit the diversification of goal

²⁹In their study, Hong et al. (2004) report that 32.53% of US households are risk tolerant.

³⁰Among the professional occupations, the reference category is different in RC2 and RC3 because of collinearity. This change does not impact the interpretation of results.

numbers than those who have a high risk tolerance level (coefficient value being the greatest). In RC3, we find that financial literacy has a significant and positive impact on the number of goals. Retail clients with high financial literacy are more prone to diversify their investment goal choices.

Table 3.6.1 – Robustness checks results

	RC1		RC2		RC3	
	Coef.	Std.	Coef.	Std	Coef.	Std
Dependent variable						
Nber of goals						
Independent variables						
Panel A: Socio-demographic indicators						
Gender	-0.0037	0.0065	-0.0130*	0.0067	-0.0118	0.0084
Age	0.0006**	0.0003	0.0062***	0.0003	0.0061***	0.0003
Native	0.0971***	0.0092	0.1327***	0.0097	0.0956***	0.0127
Paris	-0.0260***	0.0099	0.0010	0.0103	-0.0274**	0.0124
Matrimonial	0.0287***	0.0105	0.0253**	0.0108	0.0049	0.0126
Self-employed	0.0646***	0.0138	0.1505***	0.0140	0.1547***	0.0170
Salaried	0.0430***	0.0108	0.1475***	0.0119	0.1620***	0.0136
Retired	-0.0392***	0.0148	(omitted)		0.0026	0.0188
No occupation	(omitted)		-0.0432***	0.0151	(omitted)	
.....						
Panel B: Wealth and patrimony indicators						
ln(Income)	0.0707***	0.0020				
ln(Bank loans)	0.0085***	0.0007				
Sub-panel B1: Savings accounts						
Regulated savings accounts	0.1080***	0.0069				
Standard savings accounts	0.0828***	0.0100				
Home savings accounts	0.2406***	0.0081				
Life insurance	0.3804***	0.0081				
Sub-panel B2: Financial products						
ln(Portfolio value)	0.0279***	0.0011				
.....						
Panel C: MiFID indicators						
<i>Risk tolerance level</i>						
No risk			-0.5138***	0.0249		
Low risk			0.0102	0.0252		
High risk			(omitted)			
Financial literacy					0.1050***	0.0037
_cons	0.3294***	0.0169	1.2424***	0.0344	0.8426***	0.0222
.....						
N	68,190		64,086		46,553	
F test	992.15		792.33		201.31	
Prob>F	0.0000		0.0000		0.0000	
R ²	0.1792		0.1100		0.0375	
Adjusted R ²	0.1790		0.1099		0.0373	

Table 3.6.1 displays OLS results corresponding to robustness checks (RC1, RC2 and RC3). The dependent variable “Nber of goals” takes into account G4-2 retail clients by assuming they have one investment goal. Statistical significance levels are fixed at 1%, 5% and 10% and are represented by ***, ** and * respectively.

3.7 Conclusion

In this study, we analyzed retail clients' investment decisions together with their self-assessed investment goals. This unique opportunity was provided by the availability of the answers to the MiFID questionnaire, together with the banking records of retail clients. In other words, data on investment goals are rare and, more importantly, it is even rarer to find data on both intended goals and actual decisions, for an identical set of individuals. Therefore, as soon as we had this appropriate measure of investment goals, we were able to analyze, on a more granular level, the individual's mental accounting process.

From the self-assessed investment goals of retail clients, we derive a retail client typology of mental goals, i.e. preserving wealth, increasing wealth, investing in specific long-term investments and no goal. We also show that the number of self-assessed investment goals is determined by socio-demographics, wealth and patrimony indicators. Our main result is that retail clients' actual investment decisions are consistent with their mental goals, while controlling for the same indicators. More importantly, mental goals explain approximately 10% to 20% of the likelihood of investing in the corresponding investment vehicles and are, therefore, key drivers of saving and investment decisions. Throughout this study, we use a variety of variables, of which some are defined, such as the usual drivers of investment decisions including gender, age and income. Specific variables are also taken into account, such as geographical criteria, which are rarely studied, and matrimonial regime choice, which has not yet been studied. Finally, we show that our findings are robust to three robustness checks, by considering financial wealth, risk tolerance and financial literacy.

Our findings have the following implications. First, we contribute to the literature on mental accounting because we match investment goals and fund categorization/earmarking. Second, by showing that MiFID questionnaire answers are helpful in terms of mental accounting analyses, we give an academic justification for administering this mandatory questionnaire. We show that data collection from investment service providers through MiFID, seems to achieve its objective, i.e. offering advice and financial products suited to the clients' financial situation. We hope that this finding will encourage a systematic data collection of MiFID questionnaire answers. Finally, as investment goals were assessed by individuals in a mandatory questionnaire, we expect that it could support retail clients to achieve their goals. Not only by helping them identify those goals in the first instance but also to encourage them to develop a discipline around savings and/or investments through regular or even automatic deposits, for example, a monthly direct debit to build an education fund for their children. These tools may also help people set investment goals, establish budgets and keep track of their expenses and savings. More importantly, they may also help individuals to avoid the pitfalls of mental accounting, for example, by facilitating the connection between different mental accounts that correspond to differently labeled savings accounts.

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Chapter 4

Foreign stock investment and sophistication of French retail investors

Hava Orkut^a

Abstract

Investor sophistication is usually known to attenuate behavioral biases. In this paper, we consider foreign stock investment as a proxy for investor sophistication. We combine the MiFID questionnaire answers and banking records of more than 7,000 retail investors of a large European retail bank. By performing a matching method, we show that foreign investors (*F-investors*), i.e. those directly holding at least one foreign stock, are more sophisticated than domestic investors (*D-investors*) as they diversify better in stocks and warrants both at the national and international levels. Interestingly, we find that mutual funds, bonds, unit-linked life insurance products and retirement plans are better diversified in D-investors' portfolios. Thanks to the MiFID questionnaire answers, we additionally show F-investors are more risk tolerant, less sensitive to losses and are more financially literate than D-investors. However, the home bias persists among the more sophisticated investors. We find that being older, less sensitive to losses and highly financially literate attenuate the home bias. Interestingly, we evidence that older investors with high literacy exhibit the home bias possibly due to the decline of cognitive aging with age.

Keywords : Diversification, familiarity bias, home bias, MiFID questionnaire

JEL Classification : G02, G11, G28

(a) The author thanks Marie-Hélène Broihane for her insightful comments. The author also thanks AMF for their help in providing the data and OEE for financial support.

4.1 Introduction

The investigation of retail investors' trading behavior shows that they behave differently from investors in classical models (Sharpe, 1964, Lintner, 1965 and Mossin, 1966) where they are assumed to be rational agents who attempt to maximize wealth while minimizing risk. Aside from limited stock market participation (Brown et al., 2008, Guiso et al., 2008, Grinblatt et al., 2011 and Arrondel et al., 2015), retail investors hold under-diversified portfolios in the US (Goetzmann and Kumar, 2008), in Europe (Dorn and Huberman, 2005, Anderson, 2013, Broihanne et al., 2016 and Koestner et al., 2017) and in Asia (Feng and Seasholes, 2008 and Fuertes et al., 2014). A closer examination of their portfolio allocations reveals that retail investors invest mostly in their domestic market (French and Poterba, 1991, Driessen and Laeven, 2007 and Graham et al., 2009) despite the potential gains from international diversification (e.g. risk reduction, portfolio performance improvement, exchange rate benefits, etc.).

Retail investors who trade foreign assets are usually known to exhibit lower behavioral biases (Goetzmann and Kumar, 2008 and Boolell-Gunesh et al., 2012) and are assumed to be aware of international diversification benefits. Boolell-Gunesh et al. (2012) consider trading foreign assets as a proxy for investor sophistication. However, sophistication is a concept that may reflect different facets (e.g. portfolio diversification, knowledge of complex financial products, etc.) and which is usually proxied instead of being directly measured. Besides, sophistication differs from financial literacy, which is objectively measurable through a questionnaire designed by Lusardi and Mitchell (2008, 2011a and 2014) and which has been used across different countries (e.g. France (Arrondel et al., 2013), Canada (Boisclair et al., 2017), Finland (Kalmi and Ruuskanen, 2018) and Sweden (Almenberg and S  derbergh, 2011))¹. Demographic and socioeconomic data are commonly used to assess investor sophistication, such as gender, age, income, wealth, professional occupation and trading or financial experience (Vissing-Jorgensen, 2003, Dhar and Zhu, 2006, Feng and Seasholes, 2005² and Calvet et al., 2009). For example, men, older, higher income, wealthier, professional³ and experienced investors are usually considered as sophisticated.

According to Goetzmann and Kumar (2008), investors who trade foreign assets hold better diversified domestic stock portfolios. A closer examination into asset allocations in sophisticated investors has not yet been conducted in the literature. In this paper, we investigate whether the more sophisticated investors always hold better diversified portfolios than the less sophisticated ones irrespective of the type of financial products (e.g. mutual funds, warrants, bonds, unit-linked life insurance products and retirement plans). Although sophisticated investors are usually known to exhibit less behavioral biases, we additionally test whether they suffer from the home bias while investing overseas.

¹In these studies, financial literacy is measured through three questions dealing with interest compounding, inflation and risk diversification, respectively.

²Additionally, Feng and Seasholes (2005) consider two investor sophistication covariates that are the number of trading rights (specific to China) and an indicator of portfolio diversification.

³Dhar and Zhu (2006) classify investors into "professional" category if their occupations belong to "professional/technical" or to "managerial/administrative".

In this paper, we combine banking records (extracted on the 07/31/2015) available for more than 50,000 French retail clients of a large European retail bank and their answers to the Markets in Financial Instrument Directive⁴ (MiFID henceforth) questionnaire. We conduct an in-depth analysis of foreign stock investment or equivalently, of the trading characteristics of the “more sophisticated investors”. Our analysis then focuses on 7,133 retail investors, i.e. retail clients who directly or indirectly invest in stocks, of whom 1,040 (14.58%) directly hold at least one foreign stock. Banking records gather information on socio-demographics, some of which are rarely or have not yet been studied (e.g. the country of birth, residency or matrimonial regime), different financial asset holdings (stocks, mutual funds, warrants, etc.) and portfolio values. Accordingly, the study of banking records enables to capture foreign investment regarding investors’ global portfolio allocation choices. As for MiFID data, we focus on retail clients’ self-assessed risk tolerance, attitudes towards losses and financial literacy. Such a combination of subjective attributes has not yet been conducted in the literature for the analysis of international diversification. Moreover, the use of MiFID data warrants high data reliability as retail clients are expected to give relevant answers in order to benefit advice and financial products suited to their financial situation.

Our paper focuses on two key issues. First, we look at the decision to invest overseas for one asset class, namely stocks. Indeed, direct stockholding reflects investors’ own investment choice as opposed to mutual funds investment and stocks are commonly studied in the literature on allocation choices (Hong et al., 2004, Guiso and Jappelli, 2005, Bogan, 2008, Grinblatt et al., 2011 and Biliás et al., 2017). Second, the paper analyzes together the decision to hold foreign stocks, which is objectively observable, and investor sophistication, which is proxied and subjective. Therefore, we conduct a thorough analysis of investors’ international portfolio diversification choices (available in banking records) as well as their risk tolerance, attitudes towards losses and financial literacy (assessed through the MiFID questionnaire) by controlling for investors’ heterogeneity.

Our findings contribute to the extent behavioral finance literature for the following reasons.

First, we point out that retail investors significantly differ from retail clients over a clear majority of variables, which is in line with the literature on stock market participation. Furthermore, we explore additional significant differences, by showing that retail investors are more often native-born, Parisians and opting for the separation of property matrimonial regime than retail clients. Additionally, retail investors significantly differ from retail clients regarding their MiFID questionnaire answers. They are significantly more risk tolerant, less sensitive to losses and more financially literate than retail clients.

⁴Implemented in 2007, MiFID I (2004/39/EC) gathers 31 member states of the European Economic area (28 European member states and 3 other states: Iceland, Norway and Liechtenstein). It replaces the Investment Services Directive (ISD) adopted in 1993. MiFID I aims to protect retail investors according to their level of financial knowledge. This directive requires investment service providers to collect detailed information on their clients through the MiFID questionnaire in order to offer suited advice and financial products to the clients’ situation. Implemented in January 2018, MiFID II (2014/65/UE) replaces MiFID I (2004/39/EC) that we consider in our paper. MiFID II aims to strengthen the transparency, the efficiency of financial markets but also to ensure the protection of investors. The MiFID questionnaire is only imposed to the MiFID member states and is not used in the US.

Second, the study of foreign stock investment leads to distinguish two investor groups depending on whether retail investors hold directly at least one foreign stock (labeled “Foreign investors” or *F-investors*) or not (labeled “Domestic investors” or *D-investors*). We find that these two groups significantly differ in some variables, which are usually considered as drivers of investment decisions, such as gender, age and portfolio value. To control for heterogeneity, we perform a matching process which consists in obtaining a sample where F- and D-investors are similar on observable covariates. From this matched sample, we conduct a thorough analysis by investor group regarding their portfolio diversification choices (i), which are analyzed holistically and at a more granular level, and their subjective attributes (ii), which are measured through MiFID questionnaire answers (i.e. risk tolerance, attitudes towards losses and financial literacy).

The study of portfolio diversification choices (i) reveals for the first time that foreign and domestic investors do not significantly differ in their savings behavior, while they do in financial product allocations. Indeed, F-investors hold significantly more financial products than D-investors. Interestingly, stocks and warrants dominate mutual funds, bonds, life insurance and retirement plans as much in number as in portfolio value in F-investors, while the reverse is observed in D-investors. Consequently, F-investors display a high diversification degree in stocks and warrants, while D-investors are more diversified in the other financial products. This result is still valid when domestic and foreign holdings are studied separately. Furthermore, such a distinction enables to confirm the presence of the home bias, i.e. the tendency of investors to overweight domestic assets and underweight foreign assets (French and Poterba, 1991, Cooper and Kaplanis, 1994, Ahearne et al., 2004, Graham et al., 2009, Van Nieuwerburgh and Veldkamp, 2009, Levy and Levy, 2014, Solnik and Zuo, 2016, Li et al., 2017 and Cooper et al., 2018) in our sample. To go one step further in foreign stockholding analysis, we focus on the familiarity bias, i.e. the tendency to invest in the familiar (Huberman, 2001), which is known as a possible explanation for the home bias. We find that F-investors hold more foreign stocks that are familiar, i.e. stocks from countries geographically closer to the home country and from countries which have the same official language than the home country. As a result, although F-investors are more diversified than D-investors, they invest overseas while opting for countries they are familiar with.

The use of the MiFID questionnaire answers enables to provide an accurate picture of retail investors regarding their subjective attributes (ii). Indeed, we show that F-investors exhibit a significantly higher risk tolerance level, a lower sensitivity to losses and a higher financial literacy score than D-investors. To the best of our knowledge, such a detailed description of foreign investors has not yet been documented in the literature.

Finally, an exploratory analysis is performed to identify the determinants of the home bias in F-investors. We find that the home bias weakens as F-investors get older and assess a high level of financial literacy. Interestingly, the interaction between age and financial literacy shows that older investors with high literacy exhibit the home bias possibly because of the decline of cognitive abilities with age.

Besides, the MiFID questionnaire answers contribute to explain the home bias regarding their attitudes towards losses. Specifically, F-investors who are sensitive to losses are less prone to the home bias. Risk tolerance however does not influence international stock portfolio allocations. Furthermore, overlaying the different facets of familiarity, e.g. distance, language and culture (Grinblatt and Keloharju, 2001a), being native-born of the country which is a proxy for familiarity, is shown to increase the preference for domestic stocks. Salaried are less subject to the home bias than self-employed. We therefore highlight the usefulness of the MiFID questionnaire regarding retail investors' risk profiling and its ability to point out which retail investors are the most likely to be more sophisticated.

The rest of the paper is organized as follows. Section 4.2 documents the literature on sophistication, foreign investment and the home and familiarity biases. Section 4.3 describes our data. Section 4.4 presents our methodology. Section 4.5 analyzes retail investors' portfolio diversification and their subjective attributes. Section 4.6 displays additional results related to the home bias. Section 4.7 concludes.

4.2 Related literature

Several studies show that investor sophistication is associated with a low tendency to exhibit behavioral biases, such as the disposition effect (Feng and Seasholes, 2005, Dhar and Zhu, 2006 and Boolell-Gunesh et al., 2012), under-diversification (Goetzmann and Kumar, 2008) and overconfidence (Tekçe and Yılmaz, 2015).

Most studies indirectly measure investor sophistication through sociodemographic variables, such as gender, age, income, wealth, professional occupation and geographical region of residence. For example, Feng and Seasholes (2005) consider that male and older investors are sophisticated. Analyzing data on trades and stockholdings provided by a Chinese brokerage firm, these authors find that a combination of investor sophistication and trading experience enables to eliminate the reluctance to realize losses and to reduce the propensity to realize gains by 37%. In the US, Dhar and Zhu (2006) relate investor sophistication to income and to professional occupation. They provide evidence that wealthier and investors working in professional occupations are less subject to the disposition effect. Besides, trading experience tends to decline the magnitude of the disposition effect. Analyzing a Swedish panel dataset, Calvet et al. (2009) measure financial sophistication through wealth and education. They point out that the more sophisticated households exhibit a lower disposition effect. Examining behavioral biases among mutual fund investors, Bailey et al. (2011) describe sophisticated investors as being better-informed, having a higher income, being older and having greater investment experience. Analyzing data on Turkish retail investors, Tekçe and Yılmaz (2015) measure financial sophistication by considering the average portfolio value and investor residency region. Specifically, sophisticated investors, i.e. investors with higher portfolio value and those living in the most developed region in

terms of welfare, income and education, are less prone to overconfidence. Another approach is used by Grinblatt and Keloharju (2000) who broadly consider foreign investors, finance and insurance institutions to define sophisticated investors as opposed to households. These authors show that the portfolios of the most sophisticated investors outperform those of the least sophisticated investors, i.e. households.

Other studies use indirect measures of investor sophistication related to trading characteristics. In addition to demographics (i.e. gender and age), Feng and Seasholes (2005) use the number of trading rights (Chinese specificity to get the “right” to trade) and an indicator of initial portfolio diversification to proxy for sophistication⁵. In the US, Goetzmann and Kumar (2008) find that sophisticated investors, i.e. those trading options, engaging in short-selling and having a greater investment knowledge, hold better diversified portfolios. In France, Boolell-Gunesh et al. (2012) consider an investor to be sophisticated if he/she trades foreign assets, warrants, bonds or if he/she holds two types of accounts, which are traditional accounts and/or PEA accounts⁶. These authors show that the intensity of the disposition effect is weaker among sophisticated investors. In the UK, the proxy for investor sophistication used by Richards et al. (2017) is whether an investor traded warrants. In line with Boolell-Gunesh et al. (2012), Richards et al. (2017) find that sophisticated investors exhibit a lower disposition effect.

In this paper, our measure of investor sophistication consists in identifying whether retail investors directly hold at least one foreign stock. Such a choice allows us to study investors’ portfolio diversification over foreign and also domestic financial assets. Moreover, as the decision to invest overseas is related to other behavioral biases that are identified in the literature, namely the home bias and the familiarity bias, we also focus on these two biases.

To the best of our knowledge, only a few studies focus on retail investors’ decision to trade foreign assets. Goetzmann and Kumar (2008) study the impact of foreign asset holding (i.e. ADRs, foreign stocks, and closed-end country funds) on portfolio diversification for US retail investors. They find that investors holding foreign equities hold better diversified domestic stock portfolios. Focusing on 401(k) plans of 296 firms, Bekaert et al. (2017) study international equity allocations of more than 3 million individuals. They find that international equity allocations are higher in younger cohorts than in older cohorts. Besides, access to financial advice, lower fees and more international mutual fund choices fosters international equity allocations. The authors show that international equity allocations is higher for educated and foreign-born individuals. They also document the positive impact of financial literacy on international equity allocations.

⁵This indicator is coded 1 for investors who buy at least two stocks from the beginning of their investing career and 0 for the investors who initially bought a single stock.

⁶In France, a PEA (*Plan d’Epargne en Actions* in French) account enables to invest indirectly on the stock market. This account offers a fiscal advantage to holders as soon as it is held for more than five years.

Despite the benefits of international portfolio diversification (e.g. total risk reduction⁷, return increase⁸, exchange rate benefits, etc.), a large number of investors mainly invest in domestic assets. French and Poterba (1991) study international equity portfolio holdings of the five largest stock markets in the world and report that the domestic ownership rate is about 92.2% in the US, 95.7% in Japan, 92% in the UK, 79% in Germany and 89.4% in France. Investors exhibit then a strong preference for their home equities, i.e. they are subject to the home bias.

Recent studies show that the home bias still persists all around the world. Specifically, Horioka et al. (2016) point out that the home bias is present in all economies and regions. Specifically, they indicate that European countries, the US and developing Asia display a weak home bias whereas advanced Asia, especially Japan, displays a strong home bias. Interestingly, the home bias also exists in virtual markets, for example in online crowdfunding market (Lin and Viswanathan, 2015). The strong preference towards the domestic market is identified across different asset classes, such as stocks (Kilka and Weber, 2000), mutual funds (Chan et al., 2005), bonds (Mishra and Conteh, 2014), debt securities (Horioka et al., 2016) and defined contribution pension plans (Karlsson and Nordén, 2007). Besides, the home bias has also been identified experimentally/empirically in retail investors (Graham et al., 2009), mutual fund managers (Strong and Xu, 2003), corporate managers (Dodd and Frijns, 2015), households (Dimmock et al., 2016) and students (Kilka and Weber, 2000).

The home bias can find explanations in economic factors, such as information costs (Ahearne et al., 2004) or transaction costs (Batten and Xuan Vinh, 2010), but also in behavioral factors. Indeed, according to French and Poterba (1990) and Li (2004), the lack of international portfolio diversification is due to investors' own preferences rather than to institutional constraints. By using survey data, Kilka and Weber (2000) and Strong and Xu (2003) point out that people are more optimistic towards their home market than towards international markets. Investors falsely believe that expected returns are higher and risk is lower in their home market than in foreign markets.

Interestingly, the home bias is often explained by another behavioral bias, namely the familiarity bias, i.e. the preference to invest in the familiar (Huberman, 2001). Actually, Huberman (2001) argues that investors prefer to invest in the familiar because they feel comfortable in a business visible to them while often ignoring portfolio theory. Aside from the home bias, familiarity is also expressed by the local bias (Seasholes and Zhu, 2010), i.e. the preference to invest in stock of firms headquartered in nearby the investor place of living, or by the preference to invest the retirement money in employer's stocks (Benartzi, 2001). Home and local biases have also been studied together in prior empirical works. By focusing on both US and Canadian individuals' portfolio, Ackert et al. (2005) show that participants are more familiar with both local and domestic securities leading them to invest more

⁷Risk is reduced through international diversification because stock returns are less correlated across countries than within a country.

⁸Recently, Liu et al. (2018) study foreign investment in emerging Asian markets. They find that firms with higher foreign ownership get higher stock returns during the 2007-2008 financial crisis.

in such securities. Hoechle et al. (2017) indicate that Swiss retail clients are subject to both home and local biases. Finally, the home bias is also observed among professionals. For example, Pool et al. (2012) show that the familiarity bias impacts portfolio choice of mutual fund managers. They find that the home bias is stronger among mutual fund managers who are inexperienced, are resource-constrained or who spent more time in their home state.

According to Grinblatt and Keloharju (2001a), familiarity has different facets, that are distance, language and culture. Geographical proximity is considered as an important ingredient in international portfolio investment (Tesar and Werner, 1995a). Levis et al. (2016) analyze foreign direct investment by considering 30 OECD member countries. They find that foreign direct investment flows are larger in countries geographically closer to their home country. Geographical proximity is addressed at various degrees. At the continent level, Oehler et al. (2008) demonstrate the presence of the “Europe bias” since they find that German mutual funds exhibit a strong preference for European equities. In a similar vein, Balli et al. (2010) find that, since the introduction of the Euro in 1999, there is a transition from the reduction in the home bias to the rise of the Euro bias in both equity⁹ and bond¹⁰ markets. The monetary impact was also studied by Haselmann and Herwartz (2010). These authors point out the decrease of the home bias in German investors after the introduction of the Euro. Recently, Burger et al. (2018) find that the home bias may be eliminated when foreign bonds are denominated in the investor’s currency. They suggest that the home bias is an extent of the home currency bias. As for language, Sarkissian and Schill (2004) find that when firms choose among overseas listing destinations, they prefer investing in countries with which they share common language or colonial ties. Focusing on Australian investors, Batten and Xuan Vinh (2010) also find that common language has a strong impact on overseas investment. Controlling for language, Grinblatt and Keloharju (2001a) demonstrate that investors prefer investing in firms whose CEO is of similar cultural origin. Therefore, they distinguish language from cultural background, while Fuchs and Gehring (2017) measure cultural proximity by linguistic similarity for studying the home bias in sovereign ratings.

Individual characteristics are found to be related to the home bias. Indeed, Karlsson and Nordén (2007) focus on defined contribution pension plans in Sweden and identify a home bias in individual mutual fund portfolios. They find that men are more likely to be home-biased when they get older, whereas this effect is not observed for women. As for professional occupations, investors working in the public sector have a higher likelihood of being home-biased than investors who are self-employed or who work in the private sector. In addition, they show that the higher the amount which is invested in pension plans and/or the higher the number of funds in a portfolio, the lower the likelihood to exhibit the home bias. Finally, the home bias is found to be lower in investors who are familiar with risky

⁹This switch is mainly explained by the decline of default risk and transaction cost.

¹⁰In Australia, the bond home bias is documented by Mishra and Conteh (2014). These authors find that investors prefer investing in countries with higher economic development and more developed bond markets. De Moor and Vanpée (2013) indicate that there is a decrease of the equity home bias over time contrary to the bond home bias.

investments, i.e. those who already own risky assets. Using OECD data on the foreign-born population across 28 countries, Foad (2011) documents the relationship between immigration and the equity home bias. He finds that inward migration is positively correlated with foreign equity investments reducing thus the home bias. To the best of our knowledge, only a few studies focus on investors' subjective attributes to explain the home bias. For example, Amonlirdviman and Carvalho (2010) find that, in the presence of asymmetric market comovement, gains perceived from diversification are more reduced in loss averse investors in the US. Analyzing asset allocation decisions of US investors, Guidolin and Liu (2016) find that ambiguity aversion leads to a strong home bias in equity holdings.

4.3 Data

The data used in this paper consists of banking records (extracted on the 07/31/2015) of 50,040 retail clients of a large European retail bank and their MiFID questionnaire answers. As in Bauer et al. (2009) and Hoffmann et al. (2013, 2015), minors, i.e. those aged under 18 years old, are discarded from the analysis. We restricted the sample of retail clients to retail investors, i.e. clients who hold stocks either directly (individual stocks) or indirectly (through mutual funds) like in Dimmock et al. (2016) and Hoechle et al. (2017). We also considered retail investors holding both a current account and at least one savings account within the retail bank¹¹. Finally, the analysis focuses on 7,133 retail investors, of whom 1,040 (i.e. 14.58%) directly invest in at least one foreign stock.

Banking records contain information on socio-demographics, financial asset holdings and portfolio value held by retail investors on the 07/31/2015.

The MiFID questionnaire answers contain self-assessed retail investor attributes regarding their risk tolerance, attitudes towards losses and financial literacy. Specifically, the MiFID questionnaire has been completed at least once (and at most thrice) by retail investors with a financial adviser of the bank and was unchanged over the 2007-2015 period. The first questionnaire was filled in after having subscribed to any financial instrument after 2007. The second questionnaire was completed three years after the first one. The third questionnaire was completed after having subscribed to any financial instrument after the second questionnaire or three years after the second one. Among retail investors having answered at least twice the questionnaire, only the last questionnaire answers, which the administration date is prior and closest to that of banking records, are considered in this paper. Two arguments justify this choice. First, the unreported answers rate decreases between two successive questionnaires. This leads to focus on a larger number of retail investors. Second, retail investors' answers are stable over the questionnaire administration period¹². Besides, the mandatory data collection through the MiFID questionnaire ensures data reliability. Actually, retail investors are

¹¹This choice allows to ensure that the retail bank is the principle one.

¹²For retail clients having answered at least twice the questionnaire, agreement rates were computed to check the stability of their answers. On average, 89.74% of retail investors gave the same answers over time.

expected to give relevant answers in order to benefit suited advice from their financial adviser.

Table 4.3.1 defines variables.

Section 4.3.1 describes banking records and Section 4.3.2 details MiFID data.

Table 4.3.1 – Definition of variables

Variables	Definitions
BANKING RECORDS	
Gender	Dummy variable coded 1 for males and 0 for females.
Age	Age of the retail investor as of the 07/31/2015 (in years).
Native	Dummy variable coded 1 if the retail investor is native of the country and 0 otherwise.
Paris	Dummy variable coded 1 if the retail investor lives in and close to the capital (and biggest city) of the country and 0 otherwise.
Matrimonial	Dummy variable coded 1 if the retail investor is subjected to the separation of property legal regime and 0 otherwise.
Self-employed	Dummy variable coded 1 if the retail investor perceives directly his/her income from his/her own professional activity and 0 otherwise.
Salaried	Dummy variable coded 1 if the retail investor has a wage or salary from an employer and 0 otherwise.
Retired	Dummy variable coded 1 if the retail investor is retired and 0 otherwise.
No occupation	Dummy variable coded 1 if the retail investor has no occupation (e.g. students and those having no professional activity) and 0 otherwise.
Foreign	Dummy variable coded 1 if the retail investor directly holds at least one foreign stock as of the 07/31/2015 and 0 otherwise.
Portfolio value	Total investment assets value of the retail investor as of the 07/31/2015 (in euros).
.....	
MiFID QUESTIONNAIRE ANSWERS	
Risk tolerance	Self-assessed risk tolerance. The corresponding MiFID question is “As a general rule, which assertion best describes you?”. Proposals are ranked from 0 to 2: 0 (accepting lower remuneration by taking no risk on the invested capital), 1 (seeking better remuneration by taking a capital risk) and 2 (seeking high performance by accepting a significant part of capital risk).
Attitudes twd losses	Self-assessed attitudes towards losses. The corresponding MiFID question is “If in the coming months, your portfolio value would decrease by 15%, what would you do?”. Proposals are ranked from 1 to 4: 1 (selling the entire portfolio), 2 (selling part of the portfolio), 3 (waiting until portfolio value increases) and 4 (taking advantage of lower prices to invest again).
Financial literacy	Self-assessed financial literacy ranged from 0 (no financial knowledge) to 4 (high level of financial knowledge) according to a summing scale measuring, in the MiFID questionnaire, whether the retail investor knows the risk associated with stocks (1), bonds (1) and other peculiar financial products (1), e.g. warrants, deferred service settlements, convertible bonds or other financial instruments, and whether he/she understands financial market functioning (1), e.g. change of order execution delay or existence of different types of orders.

Table 4.3.1 describes the variables in the two datasets.

4.3.1 Banking records

Banking records include classical socio-demographics, such as gender and age, and more specific variables. We distinguish native-born French retail investors (“Native”) from foreign-born ones. The distinction is also made between retail investors living in or close to the biggest city (“Paris”), in terms of economic activity and size, and those living in the other French regions. The matrimonial regime of investors is also used in this paper. Matrimonial regime completes marital status by defining wealth allocation between spouses during the marriage but also after its breakdown. Among the different French matrimonial regimes¹³, the separation of property regime (“Matrimonial”) is given due consideration in this paper. This regime enables spouses to be financially independent from each other. Therefore, the separation regime is a proxy for patrimony protection needs. In addition, Fremeaux and Leturcq (2013) indicate that individuals opting for the separation regime hold a higher graduate level than the others¹⁴. Consequently, this regime is also a proxy for education. We analyze four socio-professional categories: self-employed, salaried, retired and those having no professional activity. “Foreign” is the interest variable measuring whether or not retail clients hold directly foreign stocks¹⁵. Finally, portfolio value is computed by multiplying reported quantities by prices, which have been extracted from Eurofidai and Bloomberg on the 07/31/2015¹⁶.

Table 4.3.2 displays descriptive statistics on banking records of the initial data (N=50,040 retail clients) and the sample (N=7,133 retail investors), which was drawn from the initial data. The sample is significantly different from the initial data on the vast majority of variables. These significant differences are in line with the literature on stock market participation. Actually, retail investors in our sample are more often males (Barber and Odean, 2001), old (Balloch et al., 2014), native-born (Osili and Paulson, 2007), Parisians (Arrondel et al., 2010) and opting for the separation of property regime. In the sample, male and female retail investors are equally represented. Gender parity is seldom observed in behavioral finance works because male retail investors usually represent about 80% of the sample (Barber and Odean, 2001, Boolell-Gunesh et al., 2009, Dorn and Sengmueller, 2009, Hoffmann and Shefrin, 2014 and Bellofatto et al., 2018). On average, retail investors are around 61 years old. About 90% of retail investors are French native-born and 17% of them live in or close to Paris¹⁷. About 17% of retail investors live under the separation of property regime.

¹³In France, there are two matrimonial regimes: community and separation regimes. Community regime is based on the notion of common goods unlike the separation regime, which implies that there is no joint-ownership between spouses. In Europe, the community regime is the default regime in some countries (e.g. Belgium, France, Italy and Luxembourg), whereas the separation regime is the one applied in other countries (e.g. England, Germany and Greece). In the US, the legal matrimonial regime varies from one state to another one.

¹⁴Fremeaux and Leturcq (2013) indicate that the proportion of individuals with a master degree is about 3% to 5% higher among individuals opting for the separation regime than for those opting for a different matrimonial regime.

¹⁵Direct foreign stockholding enables to focus only on retail investors' own investment choices as opposed to investment through mutual funds.

¹⁶Only financial products, for which a valid ISIN code is available, are analyzed in this paper.

¹⁷Our sample is representative of the French demography. According to the French national statistics bureau (INSEE), 11.6% of the French population were born in a foreign country and 18.8% of them live in the Paris region in 2014.

As for socio-professional categories, retail investors are more often self-employed while retail clients are more often salaried or have no professional activity. Not surprisingly, retail investors are twice as more often retired, i.e. more experienced individuals (Korniotis and Kumar, 2011), than retail clients.

Retail investors have, on average, a significantly higher portfolio value than retail clients. Finally, direct foreign stockholding is significantly six times higher in retail investors (14.58%) than in retail clients (2.31%).

Additionally, we computed the number of stocks held by retail investors. On average, retail investors hold 2.73 stocks (the standard deviation is 6.02). This low number of stocks is in line with prior empirical studies. Actually, retail investors have been shown to hold less than five stocks in the US (Barber and Odean, 2000 and Goetzmann and Kumar, 2008), Europe (e.g. Finland (Grinblatt and Keloharju, 2009), France (Broihanne et al., 2016), Germany (Dorn and Sengmueller, 2009) and Sweden (Anderson, 2013)) and Asia (e.g. China (Chen et al., 2007) and Turkey (Fuertes et al., 2014)).

Table 4.3.2 – Descriptive statistics of banking records

Variables	Initial data (I)		Sample (S)		S - I
	%/ $\bar{X}$	std	%/ $\bar{X}$	std	
BANKING RECORDS					
Gender	52.33%	0.50	53.81%	0.50	1.48%**
Age	50.57	17.06	61.02	15.91	10.45***
Native	87.34%	0.33	89.98%	0.30	2.64%***
Paris	12.78%	0.33	16.64%	0.37	3.85%***
Matrimonial	12.40%	0.33	17.43%	0.38	5.03%***
Self-employed	14.49%	0.35	15.28%	0.36	0.79%*
Salaried	56.18%	0.50	44.79%	0.50	-11.39%***
Retired	17.75%	0.38	31.75%	0.47	14%***
No occupation	11.58%	0.32	8.18%	0.27	-3.40%***
Foreign	2.31%	0.15	14.58%	0.35	12.27%***
ln(Portfolio value)	2.37	3.92	8.88	2.59	6.51***
N	50,040		7,133		

Table 4.3.2 presents descriptive statistics on banking records of the initial data and the sample, which was drawn from the initial data. The empirical frequencies (%) and the mean ($\bar{X}$) are reported for dummy and continuous variables, respectively. The standard deviation (std) is reported for all variables. The last column reports the difference between the sample (S) and the initial data (I) per variable as well as the significance of the difference S - I tested by t-test. Significance levels are fixed at 1%, 5% and 10% that are denoted by ***, ** and * respectively.

4.3.2 MiFID questionnaire answers

In the MiFID questionnaire¹⁸, retail clients have to make a self-assessment regarding their risk tolerance (“Risk tolerance”), their attitudes towards losses (“Attitudes twd losses”) and their financial literacy (“Financial literacy”). Table 4.3.1 describes the corresponding questions in the questionnaire.

¹⁸In the MiFID questionnaire, there are six sections dealing with socio-demographic characteristics, income, patrimony, bank loans, savings capacity and investment goals, respectively. The last section is divided into four subsections dealing with the main investment goal choices, risk tolerance, experience with financial products and attitudes towards losses during a hypothetical downturn, respectively.

Risk tolerance is the level of risk that a retail client is willing to bear. “Risk tolerance” is composed of three modalities across which the risk tolerance level increases from the first modality (coded 0) to the last one (coded 2). Attitudes towards losses is the behavior that a retail client would have during a downturn. “Attitudes twd losses” is composed of four modalities across which the selling rate decreases from the first modality (coded 1) to the last one (coded 4). Risk tolerance and attitudes towards losses are assimilated with the concepts of risk aversion and loss aversion elicited in the financial decision-making literature and are usually measured on lottery choices (Holt and Laury, 2002 and Abdellaoui et al., 2008). As for financial literacy, retail clients must report their knowledge of stocks, bonds and other peculiar financial products and whether they know the functioning of financial markets. “Financial literacy” is a score that varies from 0 (no financial knowledge) to 4 (high financial knowledge).

Table 4.3.3 displays descriptive statistics on these variables for the initial data and for the sample. Significant differences are observed, especially regarding risk tolerance. About 70% of retail investors are risk tolerant (modalities 1 and 2) while this percentage is about 40% in retail clients. Retail investors are then more risk tolerant than retail clients. Besides, retail investors exhibit different attitudes towards losses. About 92% of retail clients would wait or acquire new financial securities (modalities 3 or 4) during a downturn while this percentage is about 84% in retail clients. Finally, the average financial literacy score (2.59 out of 4) is significantly greater in retail investors than in retail clients (1.96). Therefore, retail investors are more financially literate than retail clients.

Table 4.3.3 – Descriptive statistics of MiFID questionnaire answers

Variables	Modalities	Initial data (I)		Sample (S)		S - I
		%/ $\bar{X}$	std	%/ $\bar{X}$	std	
MiFID QUESTIONNAIRE ANSWERS						
Risk tolerance						
	0	60.44%	0.49	28.80%	0.45	-31.64%***
	1	37.18%	0.48	64.39%	0.48	27.21%***
	2	2.38%	0.15	6.81%	0.25	4.43%***
Attitudes twd losses						
	1	9.73%	0.30	3.06%	0.17	-6.67%***
	2	6.73%	0.25	4.81%	0.21	-1.92%***
	3	76.42%	0.42	79.78%	0.40	3.36%***
	4	7.12%	0.26	12.35%	0.33	5.23%***
Financial literacy		1.96	1.15	2.59	1.02	0.63***
N		50,040		7,133		

Table 4.3.3 presents descriptive statistics on the MiFID questionnaire answers of the initial data and the sample, which was drawn from the initial data. The empirical frequencies (%) and the mean($\bar{X}$) are reported for dummy and continuous variables, respectively. The standard deviation (std) is reported for all variables. The last column reports the difference between the sample (S) and the initial data (I) per variable as well as the significance of the difference S - I tested by t-test. Significance level of 1% is denoted by ***.

4.3.3 Foreign stock investment

In this paper, we consider that foreign stock investment is a proxy for investor sophistication. Accordingly, we discriminate two groups of retail investors: “Foreign investors” (labeled *F-investors* henceforth), who hold directly at least one foreign stock, and “Domestic investors” (labeled *D-investors* henceforth), who only hold domestic stocks. The interest variable “Foreign” is then coded 1 for F-investors and 0 for D-investors.

Foreign investment is usually found to be impacted by objective investor attributes, such as gender (Graham et al., 2009)¹⁹, age (Bekaert et al., 2017), country of birth (Bekaert et al., 2017), education (Bose et al., 2015), occupation (Karlsson and Nördén, 2007) and portfolio value (Graham et al., 2009). Consequently, F- and D-investors are expected to exhibit different banking records.

Table 4.3.4 displays descriptive statistics of banking records by group of investors. Results show that F-investors significantly differ from D-investors on quite all variables. In line with the literature, we find that F-investors are more often male (Graham et al., 2009) than D-investors. The average age is significantly higher in F-investors than in D-investors. We expect that foreign investment is positively correlated with age since older investors have greater investment knowledge (Korniotis and Kumar, 2011). For the first time, we point out that F-investors are more often Parisians and opt more for the separation regime than D-investors. These results are not surprising. Indeed, Paris is an international French city thus fostering foreign investment. Consequently, investors living in or close to Paris are more prone to invest overseas. The choice of the separation regime can be associated with a high education degree (Fremeaux and Leturcq, 2013) and according to Bekaert et al. (2017), higher education levels lead to higher international allocations. F-investors are also more often natives than D-investors, a result in line with the one of Bekaert et al. (2017), but the difference is not significant. Looking at socio-professional categories, F-investors are significantly more often retired or unemployed than D-investors, among whom salaried are the most represented. Finally, we notice that the average portfolio value is significantly greater in F-investors than in D-investors. This result is in line with (Graham et al., 2009) who find that investors with larger portfolios are more likely to feel competent thus leading them to invest more internationally.

¹⁹Graham et al. (2009) find that male investors and investors with larger portfolios or more educated are more likely to perceive themselves competent. These authors show that investor competence has an impact on the home bias. Specifically, investors who feel competent are more willing to own foreign assets thus exhibiting less the home bias.

Table 4.3.4 – Banking records comparison between F- and D-investors

Variables	F-investors		D-investors		Difference
	%/ $\bar{X}$	std	%/ $\bar{X}$	std	
BANKING RECORDS					
Gender	58.56%	0.49	53%	0.50	5.56%***
Age	65.53	15.36	60.25	15.88	5.28***
Native	91.25%	0.28	89.76%	0.30	1.49%
Paris	25.29%	0.43	15.16%	0.36	10.13%***
Matrimonial	21.06%	0.41	16.81%	0.37	4.25%***
Self-employed	14.33%	0.35	15.44%	0.36	-1.11%
Salaried	39.04%	0.49	45.77%	0.50	-6.73%***
Retired	36.63%	0.48	30.92%	0.46	5.71%***
No occupation	10%	0.30	7.87%	0.27	2.13%**
ln(Portfolio value)	11.23	1.89	8.48	2.48	2.75***
N	1,040		6,093		

Table 4.3.4 reports empirical frequencies of dummy variables (%) and the mean ($\bar{X}$) of continuous variables for F-investors and D-investors. For each variable, we report the standard deviations (std) by investor group. The last column reports the difference computed as “F-investors - D-investors” and the significance of the difference measured by t-test. Statistical significance levels are fixed at 1% and 5% and are denoted by *** and **, respectively.

4.4 Methodology

The study of foreign stock investment leads to distinguish two investor groups, F-investors and D-investors, where F-investors directly hold at least one foreign stock.

In this paper, we aim to study the trading behavior of the *F-investors*, or equivalently, sophisticated investors. Knowing that F- and D-investors exhibit different features regarding foreign stock investment decision, the impact of the other observed baseline covariates on that decision should be controlled in order to look at any differences in savings and investment behaviors. Therefore, in this section, we first carry out a matching process in order to control for the heterogeneity between F- and D-investors among a set of classical variables. As a result, the next section will focus on two matched investor groups which only differ in the decision to hold foreign stocks. Section 4.4.1 describes the matching process. Section 4.4.2 diagnostics the quality of the matching.

4.4.1 The matching process

According to Stuart (2010), the estimation of causal effects has to discard for differences in baseline covariates. The propensity score method is often applied for treating selection bias in observational studies. The propensity score measures the probability of receiving a particular treatment conditional on observed baseline covariates (Rosenbaum and Rubin, 1983). It is usually estimated by logistic regression. The most popular propensity method is the propensity score matching which consists in pairing the treated and untreated subjects with similar propensity score values. This matching process

ensures that the only difference between the two groups is the treatment effect, the observed covariates being well-balanced in both groups.

In this paper, the heterogeneity between F- and D-investors is controlled by performing the propensity score matching wherein the treatment effect is the decision to hold foreign stocks. Specifically, the 1:1 nearest neighbor matching is carried out. This method aims to match a treated subject (F-investor) to one untreated subject (D-investor) based on the closest distance of their propensity score values. Being a probability, the average propensity score is 14.58% meaning that the probability of investing in foreign stocks is 14.58% for all retail investors (Table 4.3.2).

We choose to implement two specificities into the matching process. First, the matching is performed without replacement meaning that each F-investor is matched once to a D-investor. Second, the matching respects a caliper which consists in fixing a maximal distance between the propensity scores of the matched pairs. Actually, according to Austin (2014), matching with replacement gives estimates with higher variability and higher mean squared error than the estimates obtained by matching without replacement. Moreover, Baser (2006) and Caliendo and Kopeinig (2008) show that the use of a caliper reduces the selection bias. However, the number of matched subjects is reduced as the caliper defines a common support region and discards subjects having a propensity score value outside of this region. According to Austin (2010), we use a caliper width equal to 0.2 of the standard deviation of the logit of the propensity score as at least one of the covariates is continuous²⁰.

The choice of variables to include into the matching process is crucial. According to Caliendo and Kopeinig (2008), economic theory and prior empirical findings enable to select the variables to include in the propensity score estimation. Adding non-significant variables can increase the variance of estimates (Bryson et al., 2002) or omitting important variable can increase the bias in estimates (Heckman et al., 1997). Caliendo and Kopeinig (2008) suggest that statistical significance of a variable in explaining the treatment effect may help to take a decision. As the propensity score has to be defined in terms of observed covariates (Rosenbaum, 2001), we match F- and D- investors on the banking record variables. This choice is justified by prior behavioral finance studies (Section 4.3.3) and/or statistical differences observed between F- and D-investors (Table 4.3.4). To estimate the propensity scores, we regress our main variable “Foreign” on banking record variables.

Table 4.4.1 reports the results of the binary logit model. We find that males and Parisians are significantly more likely to invest in foreign stocks. As for socio-professional categories, self-employed and retired are surprisingly less likely to invest in foreign stocks than investors who have no professional occupation probably due to the high age in the sample. Besides, retail investors with high portfolio value are more likely to invest in foreign stocks.

²⁰According to Austin (2010), the optimal caliper of 0.2 allows to eliminate at least 98% of the bias in the crude estimate. It also minimizes the mean squared error of the estimated treatment effect.

Table 4.4.1 – The determinants of the foreign stock investment

	Coef.	Std
Dependent variable		
Foreign		
Independent variables		
BANKING RECORDS		
Gender	0.2703***	0.0813
Age	0.0042	0.0035
Native	0.1958	0.1317
Paris	0.3646***	0.0946
Matrimonial	0.1385	0.0965
Self-employed	-0.3435**	0.1652
Salaried	-0.1926	0.1417
Retired	-0.4714***	0.1536
No occupation	(omitted)	
ln(Portfolio value)	0.7140***	0.0267
_cons	-9.3201***	0.3634
N	7,133	
LR Chi2	1,414.58	
Prob>Chi2	0.0000	
Log likelihood	-2,255.45	
Pseudo-R2	0.2387	

Table 4.4.1 reports the results of the binary logistic regression wherein the dependent variable “Foreign” is coded 1 if the retail investor directly holds at least one foreign stock and 0 otherwise. Independent variables are defined in Table 4.3.1. The second column reports coefficients of independent variables. The third column reports standard deviations. Statistical significance levels are fixed at 1% and 5% that are denoted by *** and **, respectively.

4.4.2 Diagnostic of the matching quality

The final matched sample is composed of 830 F-investors and 830 D-investors. Therefore, 1,660 retail investors are analyzed as of now. In this subsection, we diagnostic the quality of the matching process in order to ensure that covariates are well-balanced in the matched groups. Our matching process is consistent with all diagnostics (Stuart, 2010).

First, we compute the standardized mean differences (SMD) of the propensity score of the covariates and find that their absolute values are below the critical threshold of 25% (Rubin, 2001). Second, the ratio of the variances of the propensity score of each covariate is comprised between 0.5 and 2 (Rubin, 2001). Finally, for each covariate, the ratio of the variance of the residuals orthogonal to the propensity score in the treated group over the non-treated group is computed. Given though these ratios are comprised between 0.8 and 1.25, all covariates are considered as “good” (Rubin, 2001) meaning that they are all well-balanced in the matched groups.

Figure 4.4.1 shows that, after the matching, the standardized percentage bias and the variance ratios of the covariates are each below the critical threshold recommended by Rubin (2001).

Figure 4.4.2 displays the distribution of the propensity scores of the matched sample. There is an overlap of the propensity scores of the treated and untreated groups meaning that F- and D-investors are similar on the observed covariates.

Figure 4.4.1 – Scatter plots of the SMD vs the variance ratios before and after the matching

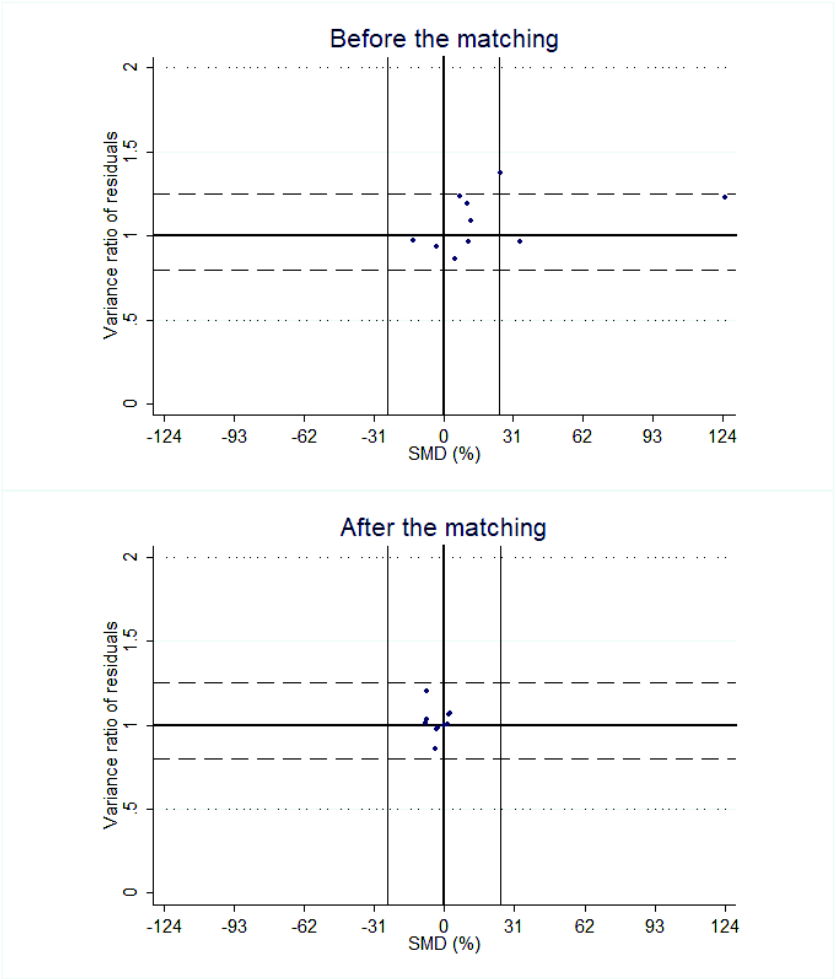


Figure 4.4.1 displays the scatter plot of the standardized mean differences (SMD) of the propensity score of the covariates and the variance ratios of residuals of the covariates before and after the matching. After the matching, the SMD of the covariates are located in the area delimited by the black vertical lines. Their absolute values respect thus the critical threshold of 25% recommended by Rubin (2001). The variance ratio of residuals of all covariates are located in the area delimited by the dotted horizontal lines, i.e. between 0.8 and 1.25, demonstrating that covariates are considered as “good” variables (Rubin, 2001).

Figure 4.4.2 – Histogram of the propensity scores by treatment status

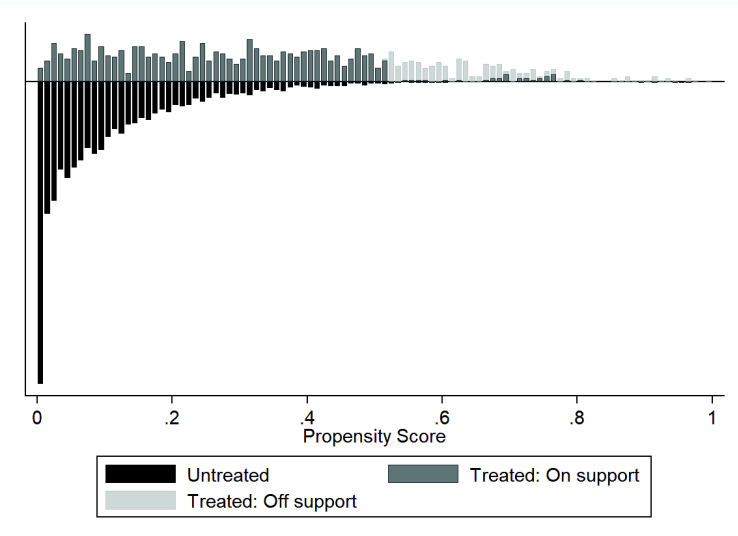


Figure 4.4.2 displays the distribution of the propensity scores of both investor groups after the matching process.

Additionally, as an overall measure of covariate balance, we re-estimate the propensity score on the matched sample by performing the logit regression and compare the pseudo- R^2 values before (0.2387) and after (0.0047) the matching. The explanatory power of the model after the matching is then very low. Finally, we perform an F-test for testing the joint significance of all covariates. We find that the F-test is significant at 1% before the matching (p-value=0.0000) while it is not after the matching (p-value=0.2861).

4.5 Portfolio diversification and subjective attributes

As F- and D-investors are similar on the observable covariates, a thorough analysis can be conducted²¹ regarding their portfolio diversification choices (Section 4.5.1) and their subjective attributes (Section 4.5.2).

4.5.1 Portfolio diversification

In this subsection, we first analyze portfolio diversification choices of each investor group holistically (Section 4.5.1.1) and then, we pay attention to foreign portfolio diversification in F-investors regarding the home bias and the familiarity bias (Section 4.5.1.2).

4.5.1.1 Global portfolio diversification

Investors' global portfolio diversification choices are first studied regarding their savings account and financial product holdings. We compute the number of different savings accounts ("Nber of savings accounts") and the number of different financial products ("Nber of financial products") held by each investor group on the 07/31/2015. Savings accounts refer to the following seven accounts: regulated savings accounts, standard savings accounts, taxed savings accounts, term deposits, popular savings accounts, home savings accounts, home savings plans and life insurance savings accounts. As for financial products, we have information on stocks ("Stocks"), mutual funds ("Funds"), warrants ("Warrants"), bonds ("Bonds"), unit-linked life insurance products ("UL life insurance") and retirement plans ("Retirement"). To distinguish domestic from foreign financial products, we add the prefixes "FR-" for French ISIN codes (Table 4.5.1, (ii) Domestic holdings) and "F-" for foreign ISIN codes (Table 4.5.2, (iii) Foreign holdings).

Then, we conduct a granular portfolio diversification analysis for each kind of financial product. To do this, we use three portfolio diversification measures. The first measure (columns 2 and 4 of Table 4.5.1) is the number of financial products (N) in the investor portfolio. For the second measure, we compute the total investment value (or the portfolio value) of each financial product

²¹Given though the matching process enables to focus on two homogeneous investor groups with equal sample size, t-tests are performed to compare the two groups.

(V). For ease of interpretation, we report the natural logarithm of the portfolio value, noted $\ln(V)$ (columns 3 and 5 of Table 4.5.1). The third measure is the Herfindhal-Hirschman Index (HHI), which is approximately the sum of squared portfolio weights (Goetzmann and Kumar, 2008). Being a measure of portfolio concentration, this measure is only computed for stocks. HHI is comprised between 0 (for well-diversified portfolios) and 1 (for under-diversified portfolios with only one stock). Additionally, to account for mutual funds diversification, we adjust HHI by assimilating mutual funds with a portfolio of 50 equally weighted securities (Koestner et al., 2017). This adjusted HHI is denoted $\text{HHI}_{\text{adjusted}}$ hereafter.

Table 4.5.1 displays descriptive statistics and tests of differences on portfolio value, savings accounts and financial products, which are first analyzed holistically (Table 4.5.1, (i) Overall holdings) and then, at the country level (Table 4.5.1, (ii) Domestic holdings).

First, we point out that there is no significant difference in the number of savings accounts between F- and D-investors. However, the two investor groups differ significantly in the number of financial products as F-investors hold on average a higher number of financial products than D-investors²².

A closer examination at financial products (Table 4.5.1, (i) Overall holdings) shows that F- and D-investors significantly differ in the number of financial products and in the portfolio value of each financial product. Interestingly, stocks and warrants dominate the other products as much in number as in portfolio value in F-investors while the reverse is observed in D-investors. Actually, F-investors hold an average of 10 stocks, i.e. around thrice as more than D-investors. Besides, the average stock portfolio value of F-investors is significantly larger than the one of D-investors. On average, the stock portfolio value of F-investors is around €69,338, while it is around €29,326 (i.e. around 2.5 times lower) in D-investors. Consequently, HHI of F-investors is significantly lower than the one of D-investors²³. F-investors hold then less concentrated, i.e. more diversified, stock portfolios than D-investors²⁴. Likewise, the number of warrants and the corresponding portfolio value are significantly higher in F-investors than in D-investors. Stocks represent the largest share of F-investors' portfolio value, while mutual funds dominate in D-investors' portfolio as much in number as in portfolio value. Besides, $\text{HHI}_{\text{adjusted}}$ of D-investors is significantly lower than the one of F-investors meaning that, by considering funds into stock portfolio, D-investors hold significantly more diversified, or less concentrated, portfolios. This result confirms the significantly higher portfolio value of mutual funds observed

²²The difference in portfolio value is no longer significant due to the matching process.

²³HHI is only computed for 427 D-investors (out of 830) and there are 427 D-investors who hold individual stocks and 403 D-investors who invest indirectly in the stock market through mutual funds.

²⁴Since HHI depends on the number of stocks (i.e. it decreases when the number of stocks increases), we additionally test whether HHI decreases across three F-investor groups (F_1 , F_2 and F_3) differing in the number of stocks: (a) between 1-3 stocks (the 25th percentile); (b) between 4-14 stocks (the 25th-75th percentiles) and (c) between 15-68 stocks (the 75% percentile). We particularly look at F-investors' stockholdings because stocks are their main investment vehicles at both national and international levels. We check that stock HHI level decreases also from F_1 to F_3 . The number of savings accounts and the number of different kinds of financial products increase across the three groups. Besides, F-investors holding a larger number of stocks also hold a larger number of financial products and invest more in these products. These results are robust when domestic and foreign holdings are separately considered.

between D- and F-investors. As for the other financial products, D-investors display a higher diversification degree in mutual funds, bonds, unit-linked life insurance and retirement plans than F-investors, whichever we consider the number of each financial product or the volume.

The overall interpretations we made on global portfolio diversification are also valid when we only consider domestic holdings of the two investor groups²⁵. Indeed, by comparing domestic (ii) to overall holdings (i), we notice that the differences in diversification between F- and D-investors observed in (ii) are similar to those observed in (i) regarding statistical significance levels and signs. F-investors therefore diversify more on domestic stocks and warrants whereas D-investors diversify more on domestic mutual funds, bonds, unit-linked life insurance and retirement plans. Consequently, aside from investing in foreign stocks, F-investors also diversify significantly more on domestic stocks than D-investors. This finding is in line with Goetzmann and Kumar (2008) who point out that US retail investors trading foreign assets hold more diversified domestic stock portfolios.

To sum up, we find that F-investors hold better diversified stock portfolios than D-investors. We additionally find that F-investors diversify better their warrant portfolios than D-investors leading to conclude that complex financial products, that are warrants, dominate in more sophisticated investors as much in number as in portfolio value. This result is in line with Boolell-Gunesh et al. (2012). According to these authors, trading warrants requires familiarity with option-like payoffs and is also considered as a proxy for investor sophistication.

²⁵ Actually, 13.37% of D-investors hold foreign unit linked life insurance products and 4.82% of them hold foreign mutual funds. These products are not further analyzed since we mainly focus on direct (i.e. stocks) foreign investment.

Table 4.5.1 – Global portfolio diversification

Variables	F-investors		D-investors		Difference	
	$\bar{N}_F$	$\ln(V_F)$	$\bar{N}_D$	$\ln(V_D)$	$\bar{N}_F - \bar{N}_D$	$\ln(V_F) - \ln(V_D)$
Portfolio value	-	10.72 (1.69)	-	10.80 (1.88)	-	-0.09
.....						
SAVINGS ACCOUNTS						
Nber of savings accounts	2.65 (1.14)	-	2.73 (1.11)	-	-0.08	-
.....						
FINANCIAL PRODUCTS						
Nber of financial products	2.28 (0.87)	-	2.17 (0.84)	-	0.11***	-
(i) Overall holdings						
Stocks	9.66 (8.14)	10.03 (1.90)	3.08 (5.32)	4.95 (5.05)	6.57***	5.08***
HHI	0.37 (0.31)		0.50 (0.34)		-0.13***	
Funds	2.24 (3.05)	5.97 (4.71)	2.65 (3.00)	8.08 (4.14)	-0.41***	-2.11***
HHI _{adjusted}	0.26 (0.29)		0.14 (0.24)		0.12***	
Warrants	0.05 (0.22)	0.25 (1.21)	0.01 (0.12)	0.10 (0.82)	0.03***	0.15***
Bonds	0.09 (0.42)	0.51 (2.20)	0.14 (0.55)	0.94 (2.87)	-0.06**	-0.43***
UL life insurance	2.45 (3.92)	4.73 (4.88)	3.23 (4.67)	6.10 (4.89)	-0.77***	-1.37***
Retirement	0.14 (0.84)	0.33 (1.66)	0.29 (1.16)	0.67 (2.36)	-0.14***	-0.34***
(ii) Domestic holdings						
FR-Stocks	8.10 (7.65)	8.79 (3.64)	3.08 (5.32)	4.95 (5.05)	5.02***	3.84***
FR-Funds	1.99 (2.66)	5.73 (4.71)	2.56 (2.66)	8.07 (4.14)	-0.56***	-2.34***
FR-Warrants	0.05 (0.22)	0.25 (1.21)	0.01 (0.12)	0.10 (0.82)	0.03***	0.15***
FR-Bonds	0.09 (0.41)	0.50 (2.18)	0.14 (0.55)	0.94 (2.87)	-0.06**	-0.44***
FR-UL life insurance	2.22 (3.34)	4.70 (4.86)	2.89 (3.90)	6.07 (4.88)	-0.67***	-1.37***
FR-Retirement	0.14 (0.82)	0.33 (1.66)	0.29 (1.16)	0.67 (2.36)	-0.14***	-0.34***
N	830		830			

Table 4.5.1 displays descriptive statistics on savings account and financial product holdings of the matched F- and D-investors. We note $\bar{N}_F$ (respectively $\bar{N}_D$) the average number of different savings accounts or financial products held by F-investors (respectively D-investors) and $\ln(V_F)$ (respectively $\ln(V_D)$), the average natural logarithm of the portfolio value held by F-investors (respectively D-investors). The last column reports the difference and the significance of the difference. Statistical significance levels are fixed at 1%, and 5% and are denoted by *** and **, respectively.

4.5.1.2 Foreign portfolio diversification: home bias and familiarity bias

To go one step further in portfolio diversification analysis, we especially look at foreign investment in F-investors regarding the home bias and the familiarity bias.

To study the presence of the home bias in F-investors, we compare their domestic holdings (ii) to their overall holdings (i) in Table 4.5.1. Looking at the number of different financial products, we point out that F-investors hold, on average, about 8 (out of 10) domestic stocks. Although they invest in foreign stocks, F-investors are subject to the home bias since, on average, 84% of stocks are held in companies inside their country. Moreover, the proportion is also high for well-diversified products. Indeed, F-investors hold relatively more domestic mutual funds (1.99 out of 2.24) and more unit-linked life insurance products (2.22 out of 2.45), which represent 89% and 91% of the total number of mutual funds and unit-linked life insurance products, respectively.

Looking at portfolio values (Tables 4.5.1 (ii) and 4.5.2 (iii)²⁶), we find that the average of the natural logarithm of the domestic stock portfolio value (8.79), or equivalently around €49,838, is larger than its corresponding foreign value (7.99), or equivalently around €19,499. However, the differences in portfolio value between domestic diversified products and foreign ones are much more striking. Indeed, the natural logarithm of the foreign mutual fund (unit-linked life insurance, respectively) portfolio value is an average 1.39 (0.94). Their corresponding domestic value is 5.73 (4.70). Thus, we point out that domestic products dominate, as much in number as in portfolio value, foreign products in F-investors' portfolio. In sum, we show that, even though the more sophisticated investors invest internationally, their portfolios are mostly diversified in domestic financial products for which they exhibit a greater preference to foreign products. Consequently, sophisticated investors are subject to the home bias while the literature shows they are less affected by behavioral biases (Goetzmann and Kumar, 2008, Boolell-Gunesh et al., 2012 and Tekçe and Yılmaz, 2015).

²⁶We do not focus on foreign bonds and retirement plans in Table 4.5.2 because they are each owned by only one F-investor. Foreign warrants are not hold in foreign countries.

Table 4.5.2 – Foreign portfolio diversification

Variables	F-investors	
	$\overline{N}_F$	$\overline{\ln(V_F)}$
FINANCIAL PRODUCTS		
(iii) Foreign holdings		
F-Stocks	1.55 (1.15)	7.99 (2.18)
F-Funds	0.25 (0.73)	1.39 (3.29)
F-UL life insurance	0.23 (0.78)	0.94 (2.72)
(iv) Geographical proximity		
Bordering stocks	0.71 (0.86)	3.80 (4.06)
Euro stocks	0.70 (0.69)	4.94 (4.27)
Other stocks	0.14 (0.57)	0.75 (2.49)
(v) Cultural proximity		
French	0.48 (0.72)	2.84 (3.84)
N	830	

Table 4.5.2 reports descriptive statistics on F-investors' foreign portfolio diversification. $\overline{N}_F$ is the average number of different financial products held by F-investors and $\overline{\ln(V_F)}$, the average natural logarithm of the portfolio value of F-investors.

In addition to the home bias, we look more deeply into foreign stock investment diversification regarding the familiarity bias, which is one possible explanation of the home bias. According to (Huberman, 2001), investors prefer to invest in the familiar because they feel more comfortable in a business visible to them while often ignoring portfolio theory. The familiarity bias is expressed either by investing in stocks of firms headquartered in nearby the investor place of living, i.e. local bias (Seasholes and Zhu, 2010) or by investing in employer's stocks in the retirement accounts (Benartzi, 2001)²⁷. Grinblatt and Keloharju (2001a) point out three familiarity attributes which are distance, language and culture. The distance is a proxy for the geographic bias which manifests itself as a *local bias*, i.e. the tendency to invest in firms headquartered in the place of living (Grinblatt and Keloharju, 2001a), or a *home bias*, i.e. the tendency to overweight domestic securities and underweight foreign securities (Graham et al., 2009).

²⁷Home and local biases were also studied together in prior empirical works. By focusing on both US and Canadian individuals' portfolio, Ackert et al. (2005) show that participants are more familiar with both local and domestic securities leading them to invest more in such securities. Hoechle et al. (2017) indicate that Swiss retail clients are subject to both home and local biases.

We analyze familiarity regarding geographical and cultural proximities, both being analyzed only for foreign stock investment. Table 4.5.2 details descriptive statistics on geographical proximity (iv), i.e. distance from the home country, and cultural proximity (v), i.e. common language. For the analysis of geographical proximity, we build three categories of stocks depending on their ISIN code: stocks from bordering countries from the home country (“Bordering stocks”), stocks from non-border European countries (“Euro stocks”) or farther, stocks from the rest of the world (“Other stocks”). Table 4.5.2 shows that F-investors hold, on average, high proportions of stocks in bordering countries (0.71 out of 1.55) and in non-bordering European countries (0.70 out of 1.55) and low proportions in the rest of the world (0.14 out of 1.55). In terms of foreign portfolio value, they also invest more in the continent. Finally, we study cultural proximity by introducing the variable “French” which measures the number of stocks invested in a foreign country where French is the official language. Out of 1.55 foreign stocks, about one third (0.48) are held in French-speaking countries. Besides, we notice that F-investors invest a high volume in these countries. As a result, F-investors hold more stocks in the countries geographically closer to the home country and/or with the same language and invest more in these countries²⁸. Although foreign stock investment is a proxy for sophistication, investors who invest abroad also exhibit greater preference for countries they are familiar with, a result which is consistent with prior studies (Sarkissian and Schill, 2004, Batten and Xuan Vinh, 2010 and Levis et al., 2016).

4.5.2 Subjective attributes

In this subsection, we compare F- and D-investors regarding their subjective attributes measured through their answers to the MiFID questionnaire.

Table 4.5.3 displays the comparison results for self-assessed risk tolerance, attitudes towards losses and financial literacy. F-investors are significantly more risk tolerant (around 12%) in the highest risk tolerance level than D-investors (9%). Looking at attitudes towards losses, the two investor groups significantly differ in the latter modality. The willingness to invest in further financial securities during a downturn is significantly higher among F-investors (around 18%) than among D-investors (around 15%). Finally, F-investors display a higher financial literacy score than D-investors. This result is in line with that of Graham et al. (2009) who show that investors who feel more skillful or knowledgeable hold more internationally diversified portfolios.

To sum up, we find that the more sophisticated investors are characterized by a high risk tolerance level, a low sensitivity to losses and a high financial literacy.

²⁸We also check that the number of foreign stocks and their corresponding portfolio value increase across the three F-investor groups, i.e. from F_1 to F_3 .

Table 4.5.3 – Descriptive statistics of the MiFID questionnaire answers after the matching

Variables	Modalities	F-investors		D-investors		Difference
		%/ $\bar{X}$	std	%/ $\bar{X}$	std	
Risk tolerance	0	18.80%	0.39	18.31%	0.39	0.48%
	1	69.28%	0.46	72.29%	0.45	-3.01%
	2	11.92%	0.32	9.40%	0.29	2.52%*
Attitudes twd losses	1	2.17%	0.15	2.17%	0.15	0.00%
	2	4.10%	0.20	4.21%	0.20	-0.11%
	3	75.90%	0.43	79.04%	0.41	-3.13%
	4	17.83%	0.38	14.58%	0.35	3.25%*
Financial literacy		2.97	0.92	2.88	1.00	0.08*
N		830		830		

Table 4.5.3 displays descriptive statistics on the MiFID questionnaire answers of the matched F- and D-investors. The last column reports the difference in MiFID questionnaire answers between F- and D-investors and the significance of the difference. Statistical significance level is fixed at 10% that is denoted by *.

4.6 Additional results: the determinants of the home bias

In this section, we conduct an exploratory analysis which consists in identifying the determinants of the home bias, i.e. the tendency of overweighting domestic securities and underweighting foreign securities, in F-investors.

We measure the home bias (HB) as the share of the volume of domestic stocks held in F-investors' stock portfolios. We choose to focus only on stocks in our measure of the home bias because we have shown that stocks represent the main investment vehicle of foreign investment²⁹.

Expressed in percentage, the home bias of investor i (HB_i) is computed as follows:

$$HB_i(\%) = \frac{V_i(FR - Stocks)}{V_i(F - Stocks + FR - Stocks)}$$

where $V_i(FR - Stocks)$ is the domestic (or French) stock portfolio value of investor i and $V_i(F - Stocks)$ is the foreign stock portfolio value of investor i .

We perform ordinary least squares regressions where the dependent variable is HB. Regarding independent variables, we introduce investor subjective attributes since F- and D-investors significantly differ regarding their risk tolerance, attitudes towards losses and financial literacy (Table 4.5.3). Indeed, such subjective attributes have been shown to impact investor trading activity (Hoffmann et al., 2015) and portfolio diversification (Dorn and Huberman, 2005). Therefore, it is interesting to investigate whether investor subjective attributes impact the home bias. Because risk tolerance and attitudes

²⁹Our measure is more accurate than the one used by Graham et al. (2009). Indeed, these authors use a dummy variable that is equal to one if an investor holds foreign assets and 0 otherwise.

towards losses are highly correlated (Spearman rank correlation coefficient is 0.28 with a p-value of 0.00)³⁰, they are separately analyzed in Models 1 and 2, respectively. Besides, banking record variables have to be included as independent variables because the study of the home bias first relies on the study of foreign stock investment (Table 4.4.1).

Finally, in order to accurately analyze the home bias, we study the interaction between age and financial literacy as our sample is mainly old. According to Korniotis and Kumar (2011), both older and experienced investors have greater knowledge on investing and diversify more internationally their equity portfolios by holding a large proportion of foreign stocks. Although older investors have better investment knowledge, these authors show that investment skill deteriorate with age because of the negative effects of cognitive aging, i.e. the decline of physical and cognitive abilities with age. They point out that the negative effects of cognitive aging dominate the positive effects of investment experience. Moreover, investors who grow older and become more experienced are known to exhibit lower levels of behavioral biases, such as the disposition effect (Dhar and Zhu, 2006), the (under-) diversification bias (Goetzmann and Kumar, 2008) and the local bias (Korniotis and Kumar, 2011). In our regression, we add the “Age×Financial literacy” interaction term like in prior studies (Goetzmann and Kumar, 2008 and Korniotis and Kumar, 2011). Our approach is however different because we focus on retail investors’ self-assessed financial knowledge instead of focusing on their observed investment experience, i.e. the number of days between the opening account day and the last day of the sample period. We remind that F-investors are significantly more financially literate (the average financial literacy score is around 2.97, see Table 4.5.3) than D-investors (for whom the score is 2.88). We therefore expect that F-investors accumulate further securities and financial knowledge as they get older and, as a consequence, are less prone to the home bias (Karlsson and Nordén, 2007 and Bekaert et al., 2017)³¹. To implement the interaction term, we first create a categorical variable “Age’ ” composed of three age brackets depending on terciles: (1) aged less than 57 years (N= 246); (2) aged between 57 and 72 years (N= 317) and (3) aged more than 72 years (N= 267).

Table 4.6.1 displays the results. Looking first at “Age’ ”, we find that belonging to an upper age bracket decreases, on average, by 16.63% the share of the volume of domestic stocks. F-investors thus exhibit less the home bias as they get older. As for financial literacy, an increase of one unit of the financial literacy score decreases, on average, by 5.90% the share of domestic stocks. Therefore, financial literacy score improvement promotes international equity portfolio investment.

The interaction term has a positive and significant coefficient estimate meaning that considering the interaction of age and financial literacy on the home bias is consistent. Actually, the decrease of the home bias is higher for age than it is for financial literacy and we suspect that cognitive aging and

³⁰We use the Spearman rank correlation coefficient as the modalities of each variable respect a natural order. For “Risk tolerance”, the risk tolerance level increases from the first modality (coded 0) to the third modality (coded 2). As for “Attitudes twd losses”, the selling rate decreases across the four modalities.

³¹Karlsson and Nordén (2007) find that investing in more funds decreases the likelihood of the home bias. Bekaert et al. (2017) document the positive effect of financial literacy on international equity allocations.

financial literacy would play different roles. A closer examination at the coefficient estimates reveals that the intensity of the home bias depends on age levels and financial literacy scores. For example, in Model 1, for a given financial literacy score (i.e. the lower one), let consider an F-investor aged 50 (i.e. belonging to the first age bracket), the negative impact of financial literacy on the home bias is around -1.24% ($= -0.0539 + 1 * 0.0415$). For the same low financial literacy level, if we consider any F-investor who belongs to the third age bracket, one would expect his home bias to increase by 7.04% ($= -0.0539 + 3 * 0.0415$). Therefore, an increase of the financial literacy score may have a negative impact for the oldest investors. We conclude that the negative effect of age is higher on the home bias than the one of financial literacy and that the difference between these two influences increases with age. To sum up, although a high financial literacy decreases the home bias, the decrease of cognitive abilities with age weakens or reverse the effect.

Then, we show that the MiFID questionnaire answers contribute in explaining the home bias, especially regarding attitudes towards losses and financial literacy. Specifically, the home bias is significantly lower in F-investors exhibiting a high sensitivity to losses, i.e. those who sell their losing securities during a downturn. The corresponding coefficient is larger, in absolute value, than those of the other significant variables. Actually, these investors may be less subject to the disposition bias, i.e. the tendency to sell faster winning securities and to hold longer losing ones (although we are only able to assess their attitudes towards losing securities), as they tend to sell their securities whose price decreased.

However, being French native-born increases on average by 7.34% the home bias. Being native-born could be considered as a proxy for familiarity with the home country because it overlays the different facets of the familiarity, such as the distance, language and culture (Grinblatt and Keloharju, 2001a). The home bias is higher among self-employed than among salaried F-investors. Finally, the intensity of the home bias increases with the portfolio value.

Table 4.6.1 – The determinants of the home bias

	Matched F-investors			
	Model 1		Model 2	
	Coef.	Std	Coef.	Std
Dependent variable				
HB				
Independent variables				
MiFID QUESTIONNAIRE ANSWERS				
Risk tolerance				
0	-0.0197	0.0429		
1	0.0202	0.0351		
2	(omitted)			
Attitudes twd losses				
1			-0.2272**	0.0920
2			(omitted)	
3			-0.0919*	0.0549
4			-0.0359	0.0598
Financial literacy	-0.0539*	0.0321	-0.0640**	0.0321
BANKING RECORDS				
Gender	-0.0196	0.0237	-0.0204	0.0236
Age'	-0.1647***	0.0475	-0.1679***	0.0473
Age'×Financial literacy	0.0415***	0.0151	0.0432***	0.0150
Native	0.0720*	0.0375	0.0747**	0.0374
Paris	0.0076	0.0280	0.0048	0.0279
Matrimonial	0.0345	0.0277	0.0351	0.0277
Self-employed	(omitted)		(omitted)	
Salaried	-0.0719**	0.0328	-0.0701**	0.0327
Retired	-0.0089	0.0401	-0.0088	0.0398
No occupation	-0.0583	0.0486	-0.0558	0.0483
ln(Portfolio value)	0.0824***	0.0069	0.0828***	0.0068
_cons	0.0056	0.1349	0.1171	0.1374
N	830		830	
Prob>F	0.0000		0.0000	
R²	0.2042		0.2114	
Adjusted R²	0.1915		0.1979	

Table 4.6.1 reports the results of the ordinary least squares regression that aims to identify the determinants of the home bias. The dependent variable is the share of domestic stocks in the F-investor stock portfolio (HB) and the independent variables are defined in Table 4.3.1. Statistical significance levels are fixed at 1%; 5% and 10% and are denoted by ***, ** and *, respectively.

4.7 Conclusion

In this study, we analyze foreign stock investment as a proxy for investor sophistication. Actually, trading foreign assets is shown to reduce the intensity of the disposition effect (Booelll-Gunesh et al., 2012) and to increase portfolio diversification (Goetzmann and Kumar, 2008). Relative to prior studies, our sophistication measure is direct and more accurate as we only focus on one asset class, namely stocks, and consequently, analyze investors' own investment choice as opposed to the one of mutual fund managers.

We combine the MiFID questionnaire answers and the banking records provided by a large European retail bank and available for more than 50,000 French retail clients, of whom around 7,000 are retail investors, i.e. they hold directly or indirectly stocks. We first show that retail investors and retail clients differ significantly on a vast majority of banking record variables, which is consistent with the literature on stock market participation. We additionally show that retail investors are more often native-born, living in the Paris region and opting for the separation of property matrimonial regime. Noteworthy differences are found in their MiFID questionnaire answers. Specifically, retail investors are significantly more risk tolerant, less sensitive to losses and exhibit a higher financial literacy score than retail clients. We distinguish two investor groups depending on whether they hold at least one foreign individual stock (Foreign investors or *F-investors*) or not (Domestic investors or *D-investors*). After performing a matching method, we find that stocks and warrants dominate as much in number as in portfolio value, mutual funds, bonds, unit-linked life insurance products and retirement plans in F-investors, while the reverse is observed in D-investors. These findings hold both at the national and international levels. Analyzing the MiFID questionnaire answers, we show that F-investors are significantly more risk tolerant, less sensitive to losses and more financially literate than D-investors.

Despite of diversifying internationally their portfolio, F-investors exhibit the home bias. We find that the home bias decreases as F-investors get older. A high financial literacy score promotes international stock portfolio diversification. Interestingly, the interaction between age and financial literacy shows that the impact of cognitive aging with age is greater on the home bias than the one of financial literacy. Therefore, older investors with high literacy are subject to the home bias. Additionally, we show that MiFID questionnaire answers contribute in explaining the home bias. F-investors who are sensitive to losses are less subject to the home bias. However, self-assessed risk tolerance levels have no influence on the home bias. Besides, we evidence that the home bias is higher among native-born and self-employed than among foreign-born and salaried. Finally, the home bias increases with F-investors' portfolio value.

We thus show that attitudes towards losses and financial literacy "which are assessed through the MiFID questionnaire" give useful insights into which retail investors are the most likely to invest overseas, or equivalently, to be the more sophisticated. We then show that questions based on retail

investors' self-assessment are then important determinants of the decision to invest in foreign stocks. Such questions would thus help MiFID questionnaire developers to build their risk profile depending on their financial knowledge, i.e. to fit MiFID requirements, but also to encourage them to invest overseas. Consequently, retail investors would benefit from international portfolio diversification. We therefore highlight for the first time the informativeness of the MiFID questionnaire in explaining the home bias leading us to reconcile policy making with the behavioral finance literature.

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Conclusion and limitations

This PhD dissertation contributes to the extent behavioral finance literature on French retail investors/clients while bringing relevant insights for the MiFID European regulation. We have the opportunity to study the MiFID questionnaire answers available for more than 98,000 retail clients jointly with their banking data provided by a large European retail bank.

The first chapter reviews the behavioral finance literature in which this dissertation lies and presents MiFID. A thorough analysis is dedicated to the MiFID questionnaire of the retail bank, especially regarding some framing effects. We present banking records which gather rich information on socio-demographics as well as on wealth and patrimony situation. Descriptive statistics on the overall data are provided to have a quick overview of our sample. Finally, we study unreported answers and answers stability over successive questionnaires.

The second chapter investigates stock market participation of more than 70,000 French retail clients. In France, the study of stock market participation has already been addressed by Arrondel et al. (2015). However, their data come from a household survey, while this chapter is based on stockholdings recorded into the bank computer system, thus ensuring a higher data reliability. Interestingly, we find that retail clients' self-assessed attitudes, especially their risk tolerance and attitudes towards losses, are important key drivers of the decision to participate in the stock market. Indeed, the likelihood to hold stocks is higher among retail clients exhibiting a high risk tolerance level and a low sensitivity to losses. These results are robust while controlling for usual determinants of investment decisions. Aside from MiFID indicators, we introduced new variables, i.e. geographical criteria, matrimonial regime choice and other investment vehicle holdings, that also contribute to explain the decision to hold stocks.

The third chapter analyzes actual investment decisions of more than 60,000 retail clients under the framework of mental accounting, which is one of the important contributions of Richard Thaler (1985). From retail clients' self-assessed investment goals, we derive a mental goal typology which is consistent with the fund's categorization literature. We provide evidence that retail clients' actual investment decisions are consistent with their mental goals while controlling for usual investment decision determinants. Importantly, mental goals are strong key drivers of savings and investment decisions.

The fourth chapter tackles the study of foreign stock investment, or equivalently, of investor sophistication of more than 7,000 French retail investors. Trading foreign assets is usually known to attenuate behavioral biases (Goetzmann and Kumar, 2008 and Boolell-Gunesh et al., 2012). We find that the more sophisticated investors, labeled *Foreign investors* (or *F-investors*) diversify better in stocks and warrants than the least sophisticated ones, labeled *Domestic investors* (or *D-investors*), who diversify better in other financial products. Besides, investor sophistication is associated with a high risk tolerance level, a low sensitivity to losses and a high financial literacy. However, sophisticated investors exhibit the home bias. We find that the home bias is reduced as *F-investors* get older. It is weak among *F-investors* who are sensitive to losses and it weakens as they are more financially literate. Interestingly, interacting age with financial literacy shows that the negative effect of age, i.e. the decline of cognitive abilities as individuals get older, is higher than the one of financial literacy on the home bias. The country of birth, salaried status and portfolio value also impact the home bias.

This dissertation highlights the contribution of MiFID questionnaire answers to a better understanding of the behavior of retail investors/clients in financial markets. Throughout this dissertation, we especially focused on their self-declared investment goals, risk tolerance, attitudes towards losses and financial literacy and, showed that they are all important key drivers of investment decisions while controlling for classical determinants. Therefore, we academically justified the usefulness of the MiFID questionnaire in such qualitative data collection. What is more, we demonstrated that the MiFID questionnaire seems to achieve its objective regarding risk profiling (i.e. investment decisions analyzed in Chapters 2 and 4) and advice suitability (i.e. the correspondence investment goals-actual investment decisions in Chapter 3).

Finally, it is important to acknowledge some limitations of the dissertation which can provide some directions for future researches.

First, throughout this dissertation, we assumed and tested whether the MiFID questionnaire answers of retail clients would explain their investment decisions. However, conversely, such decisions could also impact their answers to the questionnaire, leading thus to question the cause and effect relationship. To overcome such a causality problem, a difference in difference method would have been better suited. This method would first identify the differences in successive answers to the same questions and then test whether these differences explain differences in financial decisions. However, the high stability of retail clients' answers we observe in many questions would result in a very small dataset, thus making this approach inefficient. Alternatively, a randomized experiment can resolve the causality problem by allocating individuals into treatment and control groups, which are both similar on observable and unobservable characteristics. In our case, observable characteristics are objective and measurable (e.g. age or income), while unobservable characteristics are subjective (e.g. risk tolerance or sensitivity to losses). The causal effect of the treatment would then correspond to the difference

between the two groups on the decision to invest in any investment vehicle for example.

Second, an important limit is based on the availability of banking records which were extracted on the 07/31/2015. We were not provided with trading data for investors by the bank but only with end of year holdings. However, it would have been interesting to study monthly trading data for example and then to carry out panel regressions to analyze what drive retail clients' investment decisions over time. A dynamic analysis of portfolio could deepen our findings regarding retail clients' portfolio rebalancing, their risk exposure over time and their portfolios' performance. Aside from the lack of trading data, other independent variables would have been interesting to study, such as the education level, the length of financial experience outside the bank or whether retail clients speak any foreign languages for example. The availability of the MiFID questionnaire answers over time, with exact administration dates, and for a large number of retail clients nonetheless offers the opportunity to gather a huge and rich dataset. Moreover, using the last questionnaire answers enables to gather more information on retail clients since we show that their answers are stable and they gave more answers over time.

Third, due to some limitations of MiFID questions, the data we used were not exempt of bias. Some questions or proposals are likely to have been misunderstood by retail clients. For example, to correctly assess retail clients' attitudes towards losses, the bank could have given a numerical example to control for their understanding regarding the impact of a given loss (in euros) on their investment value. Retail clients could also have reported an amount (in euros) upper which they are sensitive to losses. Besides, it would have been preferable to extend the list of investment goals or to ask retail clients to self-indicate their goal to deeply understand their financial planning. More importantly, the questions used to assess risk tolerance and attitudes towards losses really differ from the well-documented methods that have been developed by researchers. As already reported by de Palma and Picard (2011), attitudes towards risk and towards losses must be evaluated through quantitative measures to ensure a higher quality of investment advice. For this purpose, the use of series of lotteries with a range of hypothetical returns would be well suited. In the same vein, Hoffmann et al. (2015) collect data from an online survey in which investor perceptions, i.e. return expectation, risk tolerance and risk perception, are assessed through a 7-point Likert scale. Likewise, in Dorn and Huberman (2005), retail investors' risk attitudes are elicited through an ordinal 4-point scale. Such a simple scale could measure more accurately retail clients' risk tolerance than the presentation offered by most retail banks. Finally, it would be interesting to test whether an objective measure of financial literacy would yield similar results than a subjective measure. Indeed, the bank could have stated the number of correct answers given by retail clients to control more their understanding, i.e. a methodology inspired of the "Big Three" questions designed by Lusardi and Mitchell (2011b). van Rooij et al. (2011) and Bianchi (2018) use the two measures of financial literacy, i.e. objective and subjective measures, and find that they are positively correlated meaning that individuals give consistent answers. Although some improvements in questionnaire design are necessary, our overall findings support that MiFID

indicators are strong predictors of retail clients' investment decisions.

We end by giving some general directions for future works, for example, comparing the MiFID questionnaire answers of bank from different European countries. Some natural extensions to European retail clients from different countries would be to assess whether MiFID achieves its objective regarding risk profiling everywhere. However, because questionnaires differ among banks, this is not possible yet.

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Résumé de thèse

« Le comportement des investisseurs individuels français : enjeux dans le cadre de la directive MiFID »

La thèse s'inscrit dans le champ de la finance comportementale car elle étudie le comportement réel des investisseurs individuels en regard des informations collectées via le questionnaire de la Directive sur les Marchés d'Instruments Financiers (MiFID).

La littérature académique accorde un intérêt croissant aux investisseurs individuels car leurs décisions financières s'écartent des prédictions de la théorie financière classique. Selon les travaux classiques en finance (Sharpe, 1964, Lintner, 1965 et Mossin, 1966), les investisseurs sont parfaitement rationnels, ils forment des anticipations pertinentes sur la base de l'ensemble des informations disponibles et maximisent leur espérance d'utilité. De nombreuses études empiriques montrent que les investisseurs individuels sont sujets à des biais comportementaux. Certains biais sont communément identifiés chez les investisseurs individuels dans le monde entier, et ont un impact sur les prix des actifs financiers (Brown et Cliff, 2005 et Baker et Wurgler, 2006, 2007). Ces biais « systématiques » constituent des anomalies à la théorie financière. Nous pouvons citer entre autres, le biais de diversification insuffisante (Goetzmann et Kumar, 2008), le biais de disposition (Shefrin et Statman, 1985) et le biais de surconfiance (Barber et Odean, 2001). Ces biais conduisent les investisseurs à effectuer des choix d'investissement non-optimaux au regard des prédictions théoriques. Par exemple, les portefeuilles des investisseurs individuels ne sont pas suffisamment diversifiés (Broihane et al., 2016 et Hoechle et al., 2017). La théorie du portefeuille de Markowitz (1952, 1959) suggère cependant de détenir un grand nombre de titres, en proportions variables selon leurs caractéristiques, afin d'éliminer le risque spécifique. Par ailleurs, les investisseurs individuels sont sujets au biais de disposition, c'est-à-dire la tendance à céder trop rapidement les titres gagnants et à conserver trop longtemps les titres perdants³². Or, cette stratégie s'avère perdante *ex post* (Odean, 1998). Enfin, les investisseurs individuels échangent sur les marchés financiers des volumes excessifs de titres car ils sont surconfiants (Glaser et Weber, 2007). Cet excès de confiance détériore la performance (Odean, 1999) car il génère des coûts de transaction et une prise de risque importants (Barber et Odean, 2001). La faible participation des investisseurs individuels sur les marchés actions est également difficile à réconcilier avec les enseignements de la théorie financière

³²Un titre gagnant (perdant) est un titre dont le prix a augmenté (diminué) depuis son achat.

classique. Par exemple, en moyenne 31% des ménages américains déclarent qu'ils participent sur le marché actions entre 1984 et 2009 (Giannetti et Wang, 2016). En France, 34% des ménages déclarent fin 2010 qu'ils détiennent des actions, de manière directe ou indirecte (Bianchi, 2018).

Bien que la littérature identifie la présence de ces biais comportementaux, il n'existe aucun moyen, *ex ante*, de détecter quels investisseurs sont susceptibles de les mettre en œuvre. La littérature a mis en lumière des caractéristiques individuelles susceptibles d'être présentes chez les investisseurs qui sont sujets à ces biais. Certaines caractéristiques sont fréquemment identifiées et communes à quelques biais comportementaux. Nous pouvons citer, entre autres, le genre, l'âge, le revenu et le niveau d'éducation. Certains de ces biais sont atténués, voir même éliminés, par exemple le biais de disposition (Feng et Seasholes, 2005). Pour détecter les investisseurs individuels sujets à ces biais et les prévenir, de nombreuses informations doivent être collectées en amont. A cet égard, la Directive sur les Marchés d'Instruments Financiers (MiFID) pourrait jouer un rôle majeur dans l'amélioration de la connaissance des clients et la détermination de leur profil financier. En effet, la directive MiFID vise à garantir aux investisseurs individuels une protection harmonisée et renforcée selon leur degré de connaissances financières. Mise en œuvre en 2007, MiFID I (2004/39/CE) impose aux prestataires de services d'investissement de collecter des informations détaillées auprès de leurs clients en utilisant un questionnaire, appelé le *questionnaire MiFID*, afin de donner des conseils et de proposer des produits adaptés à leur situation financière.

Dans la thèse, nous avons l'opportunité d'étudier les réponses au questionnaire MiFID (*Dataset 1*) ainsi que les données bancaires (*Dataset 2*) des clients d'une grande banque commerciale française³³. Ces deux bases de données rassemblent de riches informations pour plus de 98 000 clients et permettent d'analyser de façon approfondie leurs comportements financiers. Très peu d'études combinent les données déclarées (qui pourraient être subjectives) aux données provenant des registres d'un établissement financier (qui sont objectivement observables) dans la littérature (Dorn et Huberman, 2005 et Hoffmann et al., 2013, 2015, par exemple).

L'utilisation du questionnaire MiFID assure la fiabilité des données déclarées car les clients donnent des réponses pertinentes afin de recevoir des conseils appropriés de la part de leur conseiller financier, ce qui n'est pas l'enjeu des questionnaires étudiés dans les travaux précédents. La collecte obligatoire de données « clients » dans le cadre de la directive MiFID permet d'analyser un important échantillon exempt de biais de sélection. En effet, notre base de données contient à la fois des « clients » détenant uniquement un compte épargne au sein de la banque et des « investisseurs » qui participent en plus sur les marchés financiers, tandis que les études précédentes étudient uniquement le comportement des investisseurs (Barber et Odean, 2001 et Goetzmann et Kumar, 2008). En outre, l'échantillon est caractérisé par la parité hommes-femmes tandis que la proportion d'hommes est de l'ordre de 80%

³³Ces données ont été obtenues avec l'aide de l'Autorité des Marchés Financiers (AMF) et les travaux menés dans la thèse ont été financés par l'Observatoire de l'Épargne Européenne (OEE).

dans les études qui portent sur les investisseurs individuels (Barber et Odean, 2002, Boolell-Gunesh et al., 2009 et Richards et al., 2017). En France, l'étude conjointe de données MiFID et de données bancaires n'a pas encore été menée. Les données MiFID ont été utilisées en Italie pour évaluer le profil de risque des ménages (Mazzoli et Marinelli, 2014), en Belgique pour étudier le sentiment de l'investisseur (D'Hondt et Roger, 2017) ainsi que la relation entre la littératie financière subjective et le comportement de *trading* des investisseurs (Bellofatto et al, 2018). Notre étude a la particularité de rassembler un plus grand nombre de clients. L'utilisation des réponses au questionnaire MiFID offre en outre l'opportunité d'explorer un ensemble d'attributs subjectifs (tolérance au risque, attitudes face aux pertes et littératie financière), qui sont couramment étudiés dans les travaux en finance comportementale (Bollen et Povasac, 2018, Bianchi, 2018 et Xie et al., 2018).

Outre l'utilisation des données MiFID, les résultats présentés dans la thèse sont originaux tant au plan académique qu'opérationnel. Sur le plan académique, les résultats contribuent à la littérature sur le comportement des investisseurs individuels en France. Les travaux précédents ont porté sur le biais de disposition (Boolell-Gunesh et al., 2009, 2012), la diversification du portefeuille (Broihanne et al., 2016), le comportement grégaire (Merli et Roger, 2013), l'indice de sentiment de marché (Roger, 2014), les performances de portefeuille (Magron, 2012, 2014), l'impact du trading sur la volatilité du marché (Foucault et al., 2011), l'attention de l'investisseur sur l'activité de trading (Aouadi et al., 2013), la relation entre la littératie financière (Bianchi, 2018) ou les préférences face à l'ambiguïté (Bianchi et Tallon, 2018) et le rééquilibrage des portefeuilles et les phénomènes de sur- et sous-réactions sur les marchés actions (Siwar, 2011). Sur le plan opérationnel, les résultats contribuent aux réflexions menées par les instances régulatrices en Europe, telles que l'Autorité des Marchés Financiers (AMF) et l'Autorité Européenne des Marchés Financiers (ESMA), en évaluant la capacité du questionnaire MiFID à révéler le véritable profil des investisseurs et en donnant des prescriptions en matière d'améliorations du questionnaire MiFID.

La thèse comporte quatre chapitres. Le chapitre 1 présente la revue de littérature dans laquelle s'inscrit la thèse, décrit la directive MiFID ainsi que les deux bases de données utilisées dans la thèse. Le chapitre 2 vise à identifier les déterminants de la participation sur les marchés actions. Le chapitre 3 étudie l'impact des objectifs d'investissement sur les choix effectifs d'investissement. Le chapitre 4 s'intéresse à la décision d'investir directement en actions étrangères, ou encore, de façon équivalente, aux caractéristiques des investisseurs considérés « sophistiqués » par la littérature.

Le chapitre 1 « The behavior of retail investors in the light of MiFID » présente la littérature académique dans laquelle s'inscrit la thèse (section 2), puis présente la directive MiFID (section 3) ainsi que l'ensemble des données étudiées dans les chapitres 2, 3 et 4 (sections 4 à 7).

La section 2 présente tout d'abord les travaux qui étudient le processus de prise de décision des individus lorsqu'ils font face à un choix complexe. Selon ces travaux, les individus opèrent des raccourcis

de raisonnement, appelés « heuristiques », les conduisant parfois à des comportements éloignés de ce que prédit la théorie classique de la prise de décision en univers risqué (von Neumann et Morgenstern, 1947). Cette section présente ensuite la littérature dans le domaine de la finance comportementale en mettant en lumière des « biais » psychologiques auxquels sont sujets les investisseurs individuels sur les marchés financiers. Nous décrivons les biais comportementaux les plus communément cités dans la littérature ainsi que leurs déterminants.

Les sections 3 et 4 présentent la directive, le questionnaire MiFID et les données qui en sont extraites. Il est important de préciser que la directive MiFID n'impose pas un questionnaire unique. Les banques sont ainsi libres d'établir leur propre questionnaire. Cependant, les informations qu'elles doivent recueillir sont précisées par la directive et organisées autour de trois thèmes : la situation financière, les objectifs d'investissement et le niveau d'expérience et de connaissance en matière de produits financiers.

Le questionnaire MiFID de la banque a été administré au maximum trois fois aux clients entre 2007 et 2015 et n'a pas changé au cours de cette période. Il satisfait aux prescriptions de la directive Européenne mais également aux autres objectifs commerciaux et réglementaires de la banque. Le questionnaire comporte six sections qui portent respectivement sur les caractéristiques socio-démographiques, le revenu, le patrimoine, les prêts bancaires, la capacité d'épargne et les objectifs d'investissement des clients. Cette dernière section rassemble des questions sur les principaux objectifs d'investissement des clients, leur tolérance au risque, leurs attitudes face aux pertes et leurs connaissances financières. Le questionnaire est analysé de façon approfondie en y posant un regard critique, notamment sur le *framing effect*, c'est-à-dire la façon dont les questions et les propositions ont été formulées. Cette analyse permet de formuler des préconisations en matière d'améliorations du questionnaire MiFID.

La section 5 présente les données bancaires qui rassemblent de riches informations, d'une part, sur les caractéristiques socio-démographiques, telles que le pays de naissance, le département de résidence et le régime matrimonial des clients, et, d'autre part, sur les indicateurs de richesse et de patrimoine, y compris la détention de comptes épargne et de produits financiers, et la valeur du portefeuille des clients à la date du 31/07/2015.

Étant donné que certaines informations sont communes aux deux bases de données, l'utilisation de l'une ou l'autre base de données dépend de la nature de l'information à extraire. Les attributs subjectifs, qui résultent d'une auto-évaluation, sont extraits de *Dataset 1* (données MiFID), tandis que les attributs objectifs, tels que le genre, l'âge, le lieu de résidence et la détention d'actifs risqués, qui sont observables et mesurables (Dorn et Huberman, 2005), sont extraits de *Dataset 2* (données bancaires).

Les données disponibles pour notre échantillon sont organisées en trois catégories d'indicateurs : les indicateurs MiFID (*Dataset 1*), les indicateurs socio-démographiques (*Dataset 2*) et les indicateurs de richesse et de patrimoine (*Dataset 2*).

Indicateurs MiFID : Dans le questionnaire, la banque demande aux clients de choisir un ou plusieurs objectifs d'investissement parmi les sept suivants (les fréquences empiriques sont indiquées entre parenthèses) : aucun objectif (22%), constituer une épargne de précaution (56%), préparer un projet immobilier (13%), obtenir un complément de revenus (6%), préparer la retraite (12%), valoriser le capital (21%) ou préparer la transmission du patrimoine (15%). La majorité des clients a pour objectif de constituer une épargne de précaution. En effet, l'épargne est considérée comme un matelas de sécurité visant à couvrir les pertes auxquelles l'individu pourrait faire face au cours de sa vie. Selon l'INSEE (2015), l'épargne est l'investissement préféré des ménages français. En revanche, il est surprenant d'observer 22% de clients déclarant n'avoir aucun objectif; ce point fait en particulier l'objet du chapitre 3. En effet, la fixation des objectifs d'investissement est une étape préliminaire guidant les décisions financières des individus en raison de la comptabilité mentale (Thaler, 1985). Plus précisément, la comptabilité mentale décrit la façon dont les individus évaluent, organisent et catégorisent leurs flux monétaires. L'étude des objectifs d'investissement permet ainsi de comprendre comment les individus compartimentent leurs flux monétaires dans les comptes épargne et dans les produits financiers. L'étude de la relation entre les objectifs d'investissement, la comptabilité mentale et les décisions d'investissement est approfondie dans le chapitre 3.

La banque évalue le niveau de tolérance au risque des clients. La majorité des clients (69%) n'est pas du tout tolérante au risque. 31% des clients se considèrent tolérants au risque. Selon Hoffmann et al. (2015), la tolérance au risque a un impact sur l'activité de *trading* des investisseurs et leur comportement de prise de risque. Par conséquent, la tolérance au risque déclarée des clients est analysée dans les chapitres 2, 3 et 4.

Les clients évaluent également leurs attitudes face aux pertes en répondant à une question portant sur le comportement qu'ils auraient eu durant une crise (baisse de la valeur de leurs placements de 15%) sur les marchés financiers. Dans nos données, 74% des clients auraient attendu que la valeur de leurs placements remonte. 21% des clients auraient vendu tout ou une partie de leur portefeuille. Seulement 6% des clients auraient investi davantage sur les marchés financiers en période de crise. Selon Dimmock et Kouwenberg (2010), une aversion aux pertes élevée réduit la probabilité de participer sur le marché actions. En France, l'impact de la sensibilité aux pertes concernant la participation sur le marché des actions n'a pas encore été étudié. Le chapitre 2 teste cette relation. La sensibilité aux pertes est également étudiée dans le chapitre 4 pour les investisseurs détenant directement des actions étrangères.

Enfin, le questionnaire porte, d'une part, sur la connaissance du risque associé aux actions, obligations et autres services « complexes » (tels que les warrants, les services à règlement différé, etc.) et, d'autre part, sur la connaissance du fonctionnement des marchés financiers. La littérature a mis en lumière l'impact de la littératie financière sur les décisions d'investissement et l'importance économique de ce facteur a été soulignée par Lusardi et Mitchell (2014). La littératie financière est donc étudiée

dans les chapitres 2, 3 et 4.

Indicateurs socio-démographiques : L’analyse de ces indicateurs révèle que notre échantillon est caractérisé par la parité hommes-femmes. La littérature a montré que les hommes sont plus tolérants au risque (Bollen et Povasac, 2018), moins averses aux pertes (Rau, 2014) et plus instruits en matière financière (Almenberg et Dreber, 2015) que les femmes. L’âge moyen des clients est de 48 ans. Des informations plus spécifiques sont renseignées, telles que le pays de naissance, le département de résidence et le régime matrimonial des clients. Ces informations ont été retraitées à l’appui de la littérature et sont étudiées dans les chapitres 2, 3 et 4. Les clients sont distingués selon qu’ils sont nés en France ou à l’étranger. Chatterjee (2009) montre que les immigrants sont moins enclins à investir en actions aux États-Unis. Une distinction s’opère également entre les clients habitant dans la région Parisienne et ceux habitant en province. Selon Arrondel et al. (2010), les ménages habitant à Paris sont plus enclins à détenir des actifs risqués. Dans notre échantillon, 84% des clients sont nés en France et 12% des clients habitent dans la région Parisienne. Ces proportions sont cohérentes avec la démographie Française. L’étude du régime matrimonial n’a pas encore été menée dans la littérature. Parmi les différents régimes matrimoniaux, nous étudions le choix du régime matrimonial de séparation des biens afin de capturer la notion d’indépendance financière. Dans l’échantillon, environ 10% des clients vivent sous le régime de séparation des biens. Cette proportion est cohérente avec celle indiquée par l’INSEE (2010). Enfin, quatre catégories socioprofessionnelles sont créées à partir des catégories renseignées par la banque : entrepreneurs (13%), salariés (55%), retraités (16%) et ceux exerçant aucune activité professionnelle (17%). Selon Georgarakos et Inderst (2014), les entrepreneurs sont plus enclins à détenir des actions que les salariés.

Indicateurs de richesse et de patrimoine : En moyenne, le revenu mensuel net des clients est de 2 429€ et le montant total des crédits à rembourser est de 28 216€. Ces montants sont cohérents avec ceux reportés par l’INSEE. Le revenu affecte positivement la décision d’investir en actions (Agnew et al., 2003). Les ménages endettés sont moins enclins à détenir des actifs risqués (Cardak et Wilkins, 2009). Par conséquent, le revenu et le crédit sont susceptibles d’influencer la décision d’investir sur les marchés financiers (chapitres 2 et 3). De plus, *Dataset 2* offre l’opportunité d’étudier les comptes épargne et les produits financiers détenus par les clients. Nous savons si les clients détiennent un compte-courant au sein de la banque. Dans nos données, il y a sept types de comptes épargne que nous réorganisons en quatre catégories selon leurs caractéristiques : les comptes épargne règlementés (c’est-à-dire les livrets non fiscalisés), les comptes épargne standards (incluant les livrets fiscalisés, le plan épargne populaire, les dépôts à termes), les comptes épargne logement (y compris le plan épargne logement) et l’assurance-vie en euros. La majorité des clients (53%) détient un compte épargne règlementé. 31% des clients détiennent un compte assurance-vie en euros. Les comptes épargne logement et standards sont détenus respectivement par 21% et 12% des clients. Parmi les produits financiers, nous analysons les actions, les fonds, les warrants, les obligations, les plans d’épargne-retraite et l’assurance-vie en unité

de compte. Les clients détiennent plus de produits financiers diversifiés, tels que l'assurance-vie en unité de compte (15%) et les fonds (8%). Le pourcentage de détention des autres produits est inférieur à 5%. Les décisions d'épargne et d'investissement en produits financiers peuvent être analysées de façon approfondie au regard de la comptabilité mentale (chapitre 3) et des choix de diversification internationale de portefeuille (chapitre 4).

Enfin, la section 6 est dédiée aux réponses non renseignées et à la stabilité des réponses des clients ayant complété au moins deux fois le questionnaire MiFID.

Le chapitre 2 intitulé « MiFID questionnaire answers and stock market participation » a pour objectif d'identifier les déterminants de la participation sur les marchés actions de plus de 70 000 clients en combinant leurs réponses au questionnaire MiFID à leurs données bancaires.

Le marché actions est le marché financier le plus communément étudié dans la littérature académique (Brown et al., 2008, Balloch et al., 2014 et Fagereng et al., 2017). La faible participation sur les marchés actions a été documentée aux États-Unis (Poterba et Samwick, 1995), au Royaume-Uni (Attanasio et al., 2002) et en France (Arrondel et al., 2015). Selon TNS Sofres, 11% des individus détenaient des actifs financiers en France en 2015 alors que ce pourcentage était de 18% en 2009. Le taux de détention d'actions a diminué de 15,9% à 8,1% au cours de cette période. Au plan académique, la participation limitée sur les marchés actions est généralement expliquée par les coûts d'information (Mankiw et Zeldes, 1991), les coûts fixes de participation (Vissing-Jorgensen, 2002), les interactions sociales (Hong et al., 2004), la « conscience » de l'existence des actifs financiers (Guiso et Jappelli, 2005), les difficultés d'accès à internet (Bogan, 2008), le manque de confiance envers les marchés actions (Guiso et al., 2008), le quotient intellectuel (Grinblatt et al., 2011), les préférences politiques (Kaustia et Torstila, 2011), le système de redistribution des revenus (Fischer et Jensen, 2015) et l'image des marchés actions (Dobni et Racine, 2015, 2016). Dans notre échantillon, 11,05% des clients détiennent des actions, que ce soit directement ou indirectement *via* les Plans d'Épargne en Actions (PEA)³⁴.

L'étude conjointe des données déclarées et des données bancaires permet d'analyser de façon approfondie la participation sur les marchés actions. En effet, Balloch et al. (2014) et Liang et Guo (2015) utilisent uniquement les données déclarées dans un questionnaire pour étudier la participation aux marchés actions. En France, l'investissement en actions a été documenté par Arrondel et al. (2015). Ces auteurs montrent que la littératie financière a un impact positif sur la participation aux marchés actions. Cependant, leurs données ont été collectées à l'aide du questionnaire « DELTA-TNS 2002 », tandis que dans ce chapitre, les informations relatives à la détention d'actions ont été extraites des données bancaires. Nos résultats assurent ainsi une meilleure fiabilité des données. Pour la première fois, nous utilisons les réponses au questionnaire MiFID pour étudier l'investissement en actions.

Ce chapitre offre une approche originale pour étudier la participation sur les marchés actions

³⁴En France, les actions sont détenues indirectement *via* le Plan d'Épargne en Actions.

en combinant les données déclarées et les données bancaires. La décision d'investir sur les marchés actions est testée sur un échantillon caractérisé par la parité hommes-femmes. D'après la littérature, les hommes sont plus prompts à participer sur les marchés actions (Almenberg et Dreber, 2015) et détiennent plus d'actifs risqués (Charness et Gneezy, 2012) que les femmes. Les données bancaires offrent l'opportunité d'introduire des variables spécifiques, telles que le pays de naissance et le lieu de résidence, qui sont rarement étudiées dans la littérature. De plus, l'impact du choix du régime matrimonial sur la participation aux marchés actions est testé pour la première fois. Les variables de ce chapitre sont organisées de la façon suivante : le Panel A contient les réponses au questionnaire MiFID ou indicateurs MiFID, les Panels B et C regroupent les données bancaires, c'est-à-dire, respectivement les indicateurs socio-démographiques et les indicateurs de richesse et de patrimoine.

Dans le questionnaire MiFID, nous nous focalisons sur deux questions visant à évaluer respectivement la tolérance au risque et les attitudes face aux pertes des clients. La tolérance au risque (variable « Risk tolerance ») correspond au niveau de risque qu'un client accepterait. Les attitudes face aux pertes (« Attitudes toward losses ») correspondent au comportement que le client aurait eu durant une crise (baisse des valeurs de 15%) sur les marchés financiers. Ces deux variables sont les plus proches *proxys* de l'aversion au risque et de l'aversion aux pertes, qui sont couramment étudiées dans la littérature sur la prise de décision financière (Tversky et Kahneman, 1992 et Powell et Ansic, 1997). De plus, la littérature a montré qu'elles ont un impact sur la composition du portefeuille et l'activité de *trading* des investisseurs. En effet, les investisseurs ayant un niveau de tolérance au risque élevé et révisant à la hausse leur tolérance au risque sont plus enclins à effectuer des transactions et à détenir des portefeuilles risqués (Hoffmann et al., 2015). Une aversion aux pertes élevée réduit la probabilité de participer sur les marchés actions (Dimmock et Kouwenberg, 2010).

Outre les variables classiques telles que le genre, l'âge et le revenu, les données bancaires contiennent des variables spécifiques permettant d'affiner le profil des clients. Les variables du Panel B rassemblent les critères géographiques (le pays de naissance et le lieu de résidence), le choix du régime matrimonial de séparation des biens et les catégories socioprofessionnelles. Les variables du Panel C incluent le montant total de crédit restant à rembourser et les investissements en produits d'assurance-vie en unités de compte et en plans d'épargne-retraite.

Les déterminants de la participation sur le marché actions sont identifiés à l'aide d'un modèle logistique dans lequel nous étudions la décision d'investir en actions (Hong et al., 2004, Fan et Xiao, 2006 et Kaustia et Torstila, 2011). La variable dépendante « Stocks » est codée 1 si le client détient directement ou indirectement au moins une action à la date du 31/07/2015 et 0 sinon. Les variables indépendantes sont les variables des Panels A, B et C. Les indicateurs MiFID (la tolérance au risque et les attitudes face aux pertes) sont analysés séparément en raison de la corrélation élevée entre les deux variables. Nous examinons les effets marginaux (%) qui évaluent l'ampleur de l'effet de chaque variable indépendante sur la décision d'investir en actions.

Les effets marginaux des indicateurs MiFID (Panel A) sont supérieurs à ceux des déterminants usuels de la décision d'investissement, tels que le genre, l'âge et le revenu (Barber et Odean, 2001 et Korniotis et Kumar, 2011). Plus précisément, les clients ayant un niveau de tolérance au risque élevé sont plus enclins à investir en actions (Hong et al., 2004). Par exemple, le niveau de tolérance au risque le plus élevé accroît la probabilité d'investir en actions en moyenne de 18,21%. Quant aux attitudes face aux pertes, les clients souhaitant investir davantage durant une crise financière ont plus tendance à détenir des actions (la probabilité d'investir en actions augmente en moyenne de 6,33%) que les clients préférant attendre que les valeurs remontent. Les clients souhaitant vendre tout ou une partie de leur portefeuille sont moins enclins à détenir des actions (les effets marginaux valent -8,17% et -2,15%, respectivement). En d'autres termes, nous montrons que les clients qui sont moins sensibles aux pertes sont plus prompts à investir sur le marché actions, un résultat qui est cohérent avec celui de Dimmock et Kouwenberg (2010). De plus, nous montrons que la tolérance au risque a un impact plus important sur la décision d'investir en actions que la sensibilité aux pertes.

Dans le Panel B, nous montrons que les hommes sont plus enclins à participer sur le marché actions que les femmes (l'effet marginal est en moyenne de 1,20%) comme Almenberg et Dreber (2015). Les clients âgés ont plus tendance à détenir des actions (Shum et Faig, 2006). De plus, les clients nés en France, ou habitant dans la région Parisienne ou ceux vivant sous le régime matrimonial de séparation des biens (les effets marginaux moyens valent respectivement 4,32%, 3,68% et 2,67%) sont plus prompts à participer sur le marché actions. Les résultats relatifs aux variables géographiques sont cohérents avec ceux obtenus par Arrondel et al. (2010) et Luik et Steinhardt (2016). Pour la première fois, nous montrons que le choix du régime matrimonial affecte significativement l'investissement en actions. En d'autres termes, l'indépendance financière favorise la participation sur les marchés actions. De plus, les entrepreneurs ont plus tendance à détenir des actions que les salariés. Ce résultat renforce notre argument sur l'indépendance financière. Chez les salariés, nous supposons que la contrainte financière limite leur participation sur le marché actions. Les retraités ont moins tendance à détenir des actions que les salariés. En effet, l'activité professionnelle favorise les interactions sociales et par conséquent, elle est susceptible d'avoir un impact positif sur l'investissement en actions (Hong et al., 2004). De façon surprenante, les personnes sans activité professionnelle sont plus enclines à détenir des actions que les salariés. La seule interprétation que l'on peut formuler pour ces clients est l'importance du temps libre qu'ils peuvent consacrer à l'investissement en actions.

Dans le Panel C, nous montrons que le revenu mensuel net affecte positivement l'investissement en actions (l'effet marginal est en moyenne de 0,12% pour 10% de revenu supplémentaire), tandis que le montant total des crédits exerce l'effet inverse (l'effet marginal est en moyenne de -0,01% pour 10% de crédits supplémentaires), en cohérence avec Becker et Shabani (2010) et Liang et Guo (2015). De plus, la détention des produits assurance-vie en unité de compte (11,95%) et/ou plan d'épargne-retraite (9,11%) a un impact important et positif sur l'investissement en actions. Ainsi, les clients détenant au

moins un de ces produits sont prêts à accepter un risque en capital.

L'ensemble des résultats est robuste lorsque nous considérons l'expérience financière, la familiarité des clients avec le questionnaire MiFID ou avec le marché actions. Enfin, nous montrons que la littératie financière favorise la participation sur le marché actions.

En résumé, les résultats de ce chapitre montrent que les réponses au questionnaire MiFID portant sur la tolérance au risque et les attitudes face aux pertes ont un impact significatif sur l'investissement en actions, relativement aux déterminants classiques. Nos résultats contribuent ainsi au débat actuel entre les professionnels, les régulateurs et les universitaires au sujet de la pertinence du questionnaire MiFID. De plus, les critères géographiques des clients, le choix du régime matrimonial et la détention des produits assurance-vie en unité de compte et des plans épargne-retraite, ont un impact important sur la décision d'investir en actions.

Nos résultats permettent également de formuler quelques préconisations visant à améliorer le questionnaire MiFID. Une première préconisation serait de se focaliser principalement sur les préférences/attitudes des clients puisque ce chapitre a montré que ces indicateurs sont de bons prédicteurs de la décision d'investir en actions. De plus, la longueur du questionnaire gagnerait à être réduite. En effet, les clients sont moins attentifs en répondant aux dernières questions, portant sur leurs préférences/attitudes, qu'ils ne le sont face aux premières questions du questionnaire. La fiabilité des données peut donc diminuer avec la longueur du questionnaire. Enfin, le nombre de réponses non renseignées risque d'augmenter avec la longueur du questionnaire, ce qui restreint la capacité des prestataires de services d'investissement à donner des conseils et à proposer des produits adaptés à la situation de leurs clients.

Le chapitre 3 intitulé « Investment goals and mental accounting in French retail clients » étudie l'impact des objectifs d'investissement déclarés dans le questionnaire MiFID sur les choix effectifs d'investissement de plus de 60 000 clients. Ce chapitre s'inscrit dans le cadre théorique de la comptabilité mentale. Introduite par Thaler (1985), lauréat du prix Nobel d'Économie 2017, la comptabilité mentale désigne l'ensemble des opérations cognitives mises en œuvre par les individus pour prendre des décisions financières. Ce processus guide les décisions financières des individus, telles que les choix des dépenses, les décisions d'investissement mais également celles en matière de composition du portefeuille financier (Alexander et Baptista, 2011, Baptista, 2012 et Alexander et al., 2017).

Bien que la comptabilité mentale soit bien documentée dans la littérature³⁵, l'étude de la façon dont les individus forment les comptes mentaux, de l'évolution de ces comptes au cours du temps ou sous l'effet de facteurs environnementaux n'a pas encore été menée. En particulier, la formation de comptes

³⁵Voir Zhang et Sussman (2018) pour une littérature approfondie sur la comptabilité mentale.

mentaux est la plupart du temps difficile à appréhender faute de données sur les intentions/objectifs des investisseurs en amont de leurs décisions financières. Ce chapitre contribue à combler ce vide en étudiant la relation entre les objectifs d'investissement, obtenus *via* le questionnaire MiFID, les comptes mentaux et les décisions financières. La combinaison des réponses au questionnaire MiFID et des données bancaires offre l'opportunité de vérifier si les objectifs d'investissement des clients correspondent à leurs choix effectifs d'investissement. En effet, l'étude des objectifs d'investissement est une étape fondamentale intervenant avant toute prise de décision financière. La fixation d'objectifs d'investissement par les individus peut les aider à développer *ex ante* une discipline financière. Par exemple, les parents peuvent opter pour un débit automatique mensuel afin de créer un fonds finançant les études de leurs enfants.

Dans le questionnaire MiFID, la banque demande aux clients de choisir un ou plusieurs objectifs d'investissement parmi les sept suivants : aucun objectif, constituer une épargne de précaution, préparer un projet immobilier, obtenir un complément de revenus, préparer la retraite, valoriser le capital ou préparer la transmission du patrimoine. En fixant leurs objectifs d'investissement, les clients établissent leur planification financière, ce qui peut impacter leur décision d'investir dans les comptes épargne et dans les produits financiers. En moyenne, les clients de notre échantillon ont 1,30 objectifs d'investissement différents et environ 18% des clients déclarent n'avoir aucun objectif d'investissement.

Dans les données bancaires, outre les indicateurs socio-démographiques (Panel A), les indicateurs de richesse et de patrimoine (Panel B) se focalisent sur les comptes épargne (sous-panel B1) et les produits financiers (sous-panel B2). Le sous-panel B1 correspond aux quatre types de comptes épargne suivants : les comptes épargne règlementés (c'est-à-dire les livrets non fiscalisés), les comptes épargne standards (incluant les livrets fiscalisés, le plan épargne populaire et les dépôts à terme), comptes épargne logements (y compris le plan épargne logement) et l'assurance-vie en euros. En moyenne, les clients détiennent 1,34 (sur 6) comptes épargne différents. Environ 59% des clients détiennent des comptes épargne règlementés et 35% des clients détiennent un compte assurance-vie en euros. Les comptes épargne logement et standards sont détenus respectivement par 23% et 13% des clients. Le sous-panel B2 se réfère aux six produits financiers suivants : actions, fonds mutuels, warrants, obligations, assurance-vie en unité de compte et plan d'épargne retraite. En moyenne, les clients détiennent 0,34 produits financiers différents, ce qui est cohérent avec la faible participation des investisseurs sur les marchés financiers en France. Nous constatons que les clients détiennent plus de produits diversifiés, tels que l'assurance-vie en unité de compte (17%) et de fonds (10%). Le taux de détention des autres produits financiers est très faible (inférieur à 6%).

En accord avec la littérature sur la catégorisation des fonds (Shefrin et Thaler, 1988 et Thaler, 1990, 1994 et 1999) et la théorie comportementale du portefeuille (Shefrin et Statman, 2000), nous créons une typologie de 4 « objectifs mentaux » à partir des objectifs d'investissement déclarés des clients. En d'autres termes, nous agrégeons les objectifs d'investissement en objectifs mentaux à l'appui de

la littérature sur la catégorisation des fonds. Le premier objectif mental (G1) regroupe les clients ayant pour objectif de préserver leur niveau de richesse (58%), c'est-à-dire ceux qui ont opté pour la constitution d'une épargne de précaution. Le deuxième objectif mental (G2) regroupe les clients ayant pour objectif d'accumuler leur richesse (35%), c'est-à-dire ceux qui ont opté pour obtenir un complément de revenus, la valorisation du capital et/ou la préparation de la transmission du patrimoine. Le troisième objectif mental (G3) regroupe les clients ayant pour objectif de réaliser des investissements spécifiques à long-terme (23%), tels que la préparation d'un projet immobilier et/ou la retraite. Enfin, le quatrième objectif mental (G4) rassemble les clients n'ayant déclaré aucun objectif d'investissement (18%).

Une analyse spécifique est consacrée aux clients G4. Nous proposons deux explications pour justifier l'absence d'objectif d'investissement. Certains clients peuvent véritablement ne pas avoir d'objectif d'investissement car ils ne se préoccupent pas de leur avenir. Ces clients sont classés dans le sous-groupe G4-1. D'autres ont des objectifs d'investissement mais préfèrent ne pas les révéler à leur banque (sous-groupe G4-2). Nous différencions ces deux sous-groupes en étudiant le revenu mensuel moyen en fonction du nombre d'objectifs d'investissement. En effet, le revenu mensuel net moyen des clients augmente avec le nombre d'objectifs d'investissement choisis. Nous faisons l'hypothèse que les clients G4-1 n'ont pas suffisamment de revenus à allouer à un projet financier, tandis que les clients G4-2 ont au moins un objectif d'investissement car leur niveau de revenu est plus élevé. Par conséquent, nous supposons que le revenu mensuel net des clients ayant déclaré un objectif d'investissement est le seuil (2 354,11€) à partir duquel nous classons les clients G4 dans le sous-groupe G4-2. En revanche, les clients G4 ayant un revenu mensuel net inférieur à ce seuil sont classés dans le sous-groupe G4-1.

A partir de cette typologie, deux analyses empiriques sont effectuées.

La première analyse a pour objectif d'identifier les déterminants du nombre d'objectifs d'investissement (en considérant que les clients G4-2 ont en réalité un objectif d'investissement). De façon intéressante, nous montrons que le nombre d'objectifs d'investissement déclarés est positivement lié aux décisions en matière d'épargne (sous-panel B1) ou d'investissement en produits financiers (sous-panel B2). Les résultats de cette analyse sont robustes lorsque nous introduisons la valeur du portefeuille, la tolérance au risque ainsi que la littératie financière. Le nombre d'objectifs d'investissement augmente avec la valeur du portefeuille, la tolérance au risque et la littératie financière.

La seconde analyse vise à étudier si les choix effectifs d'investissement correspondent aux objectifs mentaux des clients. Nous analysons séparément les objectifs mentaux (G1, G2, G3 et G4), les placements en comptes épargne (sous-panel B1) et l'investissement en produits financiers (sous-panel B2). Les résultats montrent que les effets marginaux des objectifs mentaux sont supérieurs à ceux des variables des Panels A et B. Plus précisément, les clients G1 ont plus tendance à investir dans les comptes épargne, en particulier dans les comptes épargne classiques (11%), que dans les produits financiers. Ce résultat est cohérent puisque les clients G1 ont pour objectif de préserver leur niveau de richesse. Les

clients G2 et G3 ont tendance à investir dans les comptes épargne mais également dans les produits financiers. Les clients G2 ont tendance à investir davantage dans les comptes épargnes assurance-vie en euros (27%) et dans les produits financiers diversifiés, tels que les fonds mutuels (11%) et l'assurance-vie en unité de compte (16%). Ces choix d'investissement permettent ainsi aux clients G2 d'accroître leur niveau de richesse. Ces résultats sont similaires à ceux correspondant aux clients G3. Plus particulièrement, les clients G3 sont plus prompts à détenir des comptes épargne logement (11%) et assurance-vie en euros (15%). Ces deux comptes permettent respectivement de préparer un projet immobilier et la retraite, ce qui est cohérent avec leurs objectifs. Nous constatons que les clients G2 sont plus enclins à détenir des produits financiers que les clients G3. En effet, l'investissement sur les marchés financiers permet d'accumuler plus de richesse, ce qui est conforme aux objectifs des clients G2. Quant aux clients G4, ils ont moins tendance à détenir des comptes épargne et à investir sur les marchés financiers. Ce résultat n'est pas surprenant étant donné qu'ils n'ont aucun objectif d'investissement. L'ensemble de ces résultats montre que les choix effectifs d'investissement correspondent parfaitement aux objectifs mentaux des clients.

Dans ce chapitre, nous montrons que les décisions d'investissement des clients sont cohérentes avec leurs objectifs mentaux tout en contrôlant les déterminants usuels. Plus précisément, les objectifs d'investissement sont d'importants déterminants des décisions d'investissement, que ce soit l'investissement dans les comptes épargne ou dans les produits financiers. Par conséquent, notre étude contribue à la littérature académique en montrant la pertinence du questionnaire MiFID dans la connaissance des objectifs d'investissement des clients.

Sur le plan opérationnel, les prestataires de services d'investissement semblent donc atteindre leurs objectifs puisque les choix effectifs d'investissement de leurs clients correspondent à leurs objectifs d'investissement déclarés. Nous encourageons ainsi l'évaluation des objectifs d'investissement dans les questionnaires MiFID puisqu'ils guident les choix effectifs d'investissement. En effet, le fait de mentionner avoir un objectif d'investissement à son conseiller financier permet au client de mettre en œuvre une discipline financière afin de prendre des décisions conformes à cet objectif.

Le chapitre 4 intitulé « **Foreign stock investment and sophistication of French retail investors** » aborde l'étude de la décision d'investir directement en actions étrangères de plus de 7 000 investisseurs individuels. A la différence des chapitres 2 et 3, le chapitre 4 se focalise sur un échantillon spécifique composé de clients détenant des actions, que ce soit directement ou indirectement (*via* des fonds).

Selon Boolell-Gunesh et al. (2012), l'investissement à l'étranger est considéré comme un proxy de la sophistication des investisseurs. Leurs résultats indiquent que les investisseurs *sophistiqués* sont moins

sujets au biais de disposition. De plus, Goetzmann et Kumar (2008) montrent que les investisseurs détenant des actifs à l'étranger ont des portefeuilles d'actions domestiques plus diversifiés. Ces investisseurs sont supposés être conscients des bénéfices de la diversification internationale, tels que la réalisation de gains importants et la réduction du risque. Enfin, l'étude de l'investissement à l'étranger permet d'aborder celle du biais national, c'est-à-dire la tendance qu'ont les investisseurs à surpondérer les titres domestiques et sous-pondérer les titres étrangers (French et Poterba, 1991, Levy et Levy, 2014 et Cooper et al., 2018).

Dans ce chapitre, nous considérons qu'un investisseur est sophistiqué s'il détient directement au moins une action à l'étranger. Nous utilisons ainsi une mesure directe et précise de la sophistication en considérant une seule classe d'actifs, les actions. En effet, les actions sont les produits financiers les plus communément étudiés dans la littérature (Guiso et Jappelli, 2005, Bogan, 2008 et Biliias et al., 2017). L'étude de la décision d'investir en actions étrangères est effectuée de façon approfondie puisque l'on combine les réponses au questionnaire MiFID des investisseurs à leurs données bancaires.

Dans un premier temps, nous étudions les caractéristiques de notre échantillon d'investisseurs individuels (N=7 133 investisseurs individuels) par rapport à la population de clients de la banque (N=50 040 clients). Les différences significatives que nous identifions entre les deux groupes sont cohérentes avec les résultats de la littérature concernant la participation sur les marchés actions. En effet, notre échantillon concentre significativement plus d'hommes (Barber et Odean, 2001) mais aussi plus de personnes âgées (Balloch et al., 2014), nées en France (Osili et Paulson, 2007), habitant dans la région Parisienne (Arrondel et al., 2010) et vivant sous le régime matrimonial de séparation des biens. De plus, l'échantillon contient significativement plus d'entrepreneurs tandis que la population initiale concentre significativement plus de salariés et de personnes sans activité professionnelle. De façon intéressante, l'échantillon contient significativement deux fois plus de retraités, donc plus de personnes susceptibles d'être expérimentées en matière d'investissement (Korniotis et Kumar, 2011), que la population initiale. Le taux de détention d'actions étrangères est significativement six fois plus élevé chez les investisseurs que chez les clients. En outre, les investisseurs détiennent en moyenne 2,73 actions, ce qui confirme la présence du biais de diversification insuffisante en France (Broihanne et al., 2016). Enfin, les investisseurs individuels sont significativement plus tolérants au risque, moins sensibles aux pertes et ont significativement un score de littératie financière plus élevé que les clients.

Dans un second temps, nous distinguons les investisseurs détenant directement au moins une action étrangère (N=1 040, soit 14,58% de l'échantillon) et ceux détenant uniquement des actions domestiques (N= 6 093 investisseurs). Ces investisseurs sont respectivement nommés *Foreign investors* (ou *F-investors* ci-après) et *Domestic investors* (ou *D-investors*). Notre variable d'intérêt « Foreign » est donc codée 1 pour les *F-investors* et 0 pour les *D-investors*. La décision d'investir à l'étranger est donc communément influencée par des attributs objectifs (ou observables), tels que le genre (Graham et al., 2009), l'âge (Bekaert et al., 2017), le pays de naissance (Osili et Paulson, 2008), l'éducation (Bose

et al., 2015), la catégorie socioprofessionnelle (Karlsson et Nordén, 2007) et la valeur du portefeuille (Graham et al., 2009). En effet, nous observons que les *F-investors* concentrent significativement plus d'hommes et de personnes âgées que les *D-investors*. En outre, le nombre d'individus habitant dans la région Parisienne ou optant pour le régime matrimonial de séparation des biens est significativement plus important chez les *F-investors* que chez les *D-investors*. De plus, les *F-investors* concentrent significativement plus de retraités et de personnes sans activité professionnelle que les *D-investors*, parmi lesquels les salariés sont sur-représentés. Enfin, les *F-investors* ont significativement une valeur de portefeuille plus élevée que les *D-investors*.

Afin de contrôler cette hétérogénéité entre les groupes *F-* et *D-investors*, nous utilisons la méthode d'appariement par le score de propension (*propensity score matching*) qui vise à jumeler un groupe d'individus traités (*F-investors*) avec un groupe d'individus non traités (*D-investors*) dont les caractéristiques observables (les données bancaires) sont les plus proches possible. Aucune différence significative entre les deux groupes ne persiste après le *matching*. Au final, notre échantillon apparié comporte 830 *F-investors* et 830 *D-investors*.

Après l'obtention de l'échantillon « matché » ou homogène, nous analysons de façon approfondie les choix de diversification du portefeuille (i) d'une part, et, d'autre part, les attributs subjectifs (ii) de chaque groupe d'investisseurs.

L'analyse des choix de diversification du portefeuille (i) montre que les deux groupes d'investisseurs ne diffèrent pas significativement par leur comportement d'épargne. En revanche, ils diffèrent significativement par leur comportement sur les marchés financiers. En moyenne, les *F-investors* détiennent significativement plus de produits financiers que les *D-investors*. Pour l'étude des produits financiers, nous utilisons trois mesures de diversification. La première mesure est le nombre de produits financiers détenus dans le portefeuille. La deuxième mesure est la valeur investie dans chaque produit financier. La dernière mesure, qui concerne seulement l'investissement en actions, est l'indice d'Herfindhal-Hirschman (HHI) qui est compris entre 0 (portefeuille très diversifié) et 1 (portefeuille contenant uniquement une action). Pour tenir compte de la diversification implicite de l'investissement en fonds, nous calculons l'indice HHI ajusté. En analysant de façon approfondie la détention des produits financiers, nous constatons que chez les *F-investors*, les actions et les warrants dominent les fonds, les obligations, l'assurance-vie en unité de compte et le plan d'épargne-retraite autant en nombre de produits détenus qu'en volume alors que l'inverse est observé chez les *D-investors*. De plus, les *F-investors* détiennent des portefeuilles d'actions significativement moins concentrés (ou plus diversifiés) que les *D-investors*. Par ailleurs, les *F-investors* ont plus recours aux warrants que les *D-investors*, ce qui confirme qu'ils sont plus sophistiqués (Boolell-Gunesh et al., 2012). L'ensemble des interprétations reste valide lorsque nous distinguons pour chaque produit financier, la détention au niveau national de la détention à l'étranger. Par exemple, les *F-investors* détiennent des portefeuilles d'actions domestiques plus diversifiés que les *D-investors*. Ce résultat est cohérent avec celui de Goetzmann et Kumar

(2008). Cependant, en dépit de leur sophistication financière, les *F-investors* sont sujets au biais national. D'après Huberman (2001), le biais de familiarité permet d'expliquer le biais national. En effet, les investisseurs préfèrent investir dans ce qui semble familier. Ils détiennent ainsi dans des proportions trop importantes les titres de sociétés de leur pays. Selon Grinblatt et Keloharju (2001), la familiarité comporte trois facettes : la distance, la langue et la culture. D'après la littérature, la proximité du pays étranger (Levis et al., 2016) ainsi que les proximités culturelle (Beugelsdijk et Frijns, 2010) et linguistique (Batten et Xuan Vinh, 2010) affectent sensiblement les décisions d'investissement. En se focalisant uniquement sur les actions détenues par les *F-investors*, nous étudions les proximités géographique et culturelle. A l'aide des codes ISIN³⁶ des actions, nous identifions trois catégories d'actions : les actions de pays limitrophes de la France, celles des pays Européens (non limitrophes) et celles de pays situés dans les autres continents. Nos résultats montrent que les actions des pays Européens (qu'ils soient limitrophes ou non de la France) dominent autant en quantité qu'en volume les actions des autres continents dans le portefeuille moyen des *F-investors*. Quant à la proximité culturelle, nous trouvons que les *F-investors* investissent davantage dans les actions de pays dont la langue officielle est le français. Les proximités géographiques et culturelles guident ainsi la décision d'investissement des investisseurs sophistiqués.

Quant aux attributs subjectifs (ii), les *F-investors* sont significativement plus tolérants au risque et moins sensibles aux pertes que les *D-investors*. De plus, le score de littératie financière est significativement plus élevé chez les *F-investors* que chez les *D-investors*. Ces résultats renforcent le constat selon lequel l'investissement en actions à l'étranger est un *proxy* de la sophistication des investisseurs individuels.

Enfin, nous menons une analyse exploratoire afin d'identifier les déterminants du biais national chez les *F-investors*. Nous mesurons le biais national en calculant la part en volume des actions domestiques dans le portefeuille actions. Nos résultats montrent que l'intensité du biais national diminue avec l'âge. L'interaction de l'âge avec la littératie financière révèle que l'impact négatif du déclin des capacités cognitives avec l'âge est plus important que l'impact positif de la littératie financière sur le biais national. Les investisseurs âgés et instruits en matière financière sont donc plus sujets au biais national. Les réponses au questionnaire MiFID contribuent significativement à l'explication du biais national. En effet, les *F-investors* les plus sensibles aux pertes et/ou ceux qui ont un score de littératie financière élevé sont moins sujets au biais national. De plus, les *F-investors* nés en France et les entrepreneurs sont plus sujets au biais national que ceux nés à l'étranger et les salariés. L'intensité du biais national augmente avec la valeur du portefeuille.

Les résultats de ce chapitre contribuent à la littérature dans le domaine de la diversification internationale des investisseurs individuels. Alors que les études précédentes

³⁶Le code ISIN (*International Securities Identification Number*) est un numéro d'identification des titres financiers au niveau international.

portent surtout sur le biais national, ce chapitre se focalise sur la décision d'investir directement en actions étrangères, ou, de façon équivalente, les caractéristiques des investisseurs sophistiqués.

Nous mettons en exergue l'importance des attitudes face aux pertes et de la littératie financière évaluées dans le questionnaire MiFID pour identifier quels investisseurs sont susceptibles d'investir à l'étranger ou d'être les plus sophistiqués. Nous montrons que les questions visant à auto-évaluer les préférences et les connaissances financières des clients sont d'importants déterminants de la décision d'investir en actions étrangères. De telles questions pourraient aider les conseillers financiers à établir le profil de risque de leurs clients, mais également à les encourager à investir à l'étranger afin de bénéficier de la diversification internationale.

Ce travail de recherche a permis d'apporter un éclairage sur le comportement des investisseurs individuels sur les marchés financiers en étudiant conjointement les exigences de la réglementation Européenne et la littérature académique dans le domaine de la finance comportementale. Nous avons montré que les réponses au questionnaire MiFID portant sur le choix des objectifs d'investissement, la tolérance au risque, les attitudes face aux pertes et la littératie financière contribuent significativement à expliquer les décisions d'épargne et d'investissement. Nous donnons ainsi une justification académique à l'utilisation du questionnaire MiFID. De plus, nous montrons que le questionnaire satisfait les exigences réglementaires au regard de l'établissement du profil de risque des clients et de l'offre de conseils adéquats.

Néanmoins, ce travail a quelques limites. Tout d'abord, nous supposons que les réponses au questionnaire MiFID des clients expliquent leurs décisions d'investissement. Or, de telles décisions pourraient avoir un impact sur leurs réponses au questionnaire et mettre en question la relation de cause à effet. Une deuxième limite porte sur la disponibilité des données bancaires, qui ont été extraites le 31/07/2015. Il aurait été préférable d'étudier, par exemple, des données mensuelles afin de réaliser une analyse dynamique du portefeuille des clients et d'affiner nos résultats. D'autres informations auraient été intéressantes à étudier comme le niveau d'éducation, la durée de l'expérience financière ou la diversité des langues étrangères parlées. Enfin, les questions MiFID pourraient être améliorées pour évaluer finement les attitudes et les préférences des clients. Par exemple, il serait intéressant de vérifier si une mesure objective de la littératie financière (nombre de réponses correctes) donnerait des résultats similaires à une mesure subjective (auto-évaluation des connaissances).

Nous pouvons également donner quelques pistes pour les travaux futurs. Il serait intéressant de comparer les questionnaires MiFID des différents pays Européens et de tester si MiFID atteint son objectif en matière de profilage des clients en Europe. Cependant, en raison de l'absence d'un questionnaire commun, une telle analyse ne peut être effectuée.

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Le comportement des investisseurs individuels français enjeux dans le cadre de la directive MiFID

Résumé

Nous étudions le comportement des investisseurs individuels sur les marchés financiers en combinant les réponses au questionnaire MiFID et les données bancaires de plus de 98,000 clients d'une grande banque Européenne.

Tout d'abord, nous étudions la participation sur les marchés actions. Nous montrons que la tolérance au risque et les attitudes face aux pertes auto-évaluées des clients sont de forts prédicteurs de l'investissement en actions tout en contrôlant les déterminants classiques.

Puis, dans le cadre de la comptabilité mentale, nous créons une typologie d'objectifs mentaux et montrons que les décisions financières des clients sont cohérentes avec leurs objectifs mentaux.

Enfin, nous analysons le comportement des investisseurs détenant directement au moins une action étrangère. Nous montrons qu'ils détiennent des portefeuilles d'actions plus diversifiés que les investisseurs domestiques. Ces investisseurs sophistiqués sont plus tolérants au risque, moins sensibles aux pertes et plus instruits en matière financière mais sont sujets au biais national.

Mots clés : finance comportementale, investisseurs individuels, questionnaire MiFID

Abstract

We study retail investors' behavior on financial markets by combining the MiFID questionnaire answers and banking records of more than 98,000 retail clients of a large European retail bank.

First, we study stock market participation. We show that retail clients' self-assessed risk tolerance and attitudes towards losses are strong drivers of stockholding while controlling for classical determinants.

Second, under the mental accounting framework, we derive a typology of retail client mental goals and show that retail clients' actual investment decisions are consistent with their mental goals.

Finally, we analyze the behavior of investors directly holding at least one foreign individual stock. We show that they hold more diversified stock portfolios than domestic investors. These sophisticated investors are more risk tolerant, less sensitive to losses and more financially literate but are subject to the home bias.

Keywords : behavioral finance, retail investors, MiFID questionnaire