To what extent are MiFID tests informative?

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Work in progress, please do not quote

This version: June 5, 2015

Abstract

We address the informative content of the MiFID tests for characterizing retail investors' behavior. First of all, we report strong measures of association between the self-reported literacy in both the Suitability test and the Appropriateness test. We also find a high level of consistency between the investment profile and the self-reported financial literacy. Secondly, we find overall high level of consistency between direct proxies of financial sophistication ("objective" literacy) and self-reported financial literacy ("subjective" literacy). These findings suggest that MiFID tests are really informative to characterize retail investors. Given their relevance, they may be useful for investment firms as well as for regulators in their concern to provide investors with suitable services. MiFID tests deserve definitively more attention in that perspective.

JEL Classification: G02, G11, G28

Keywords : retail investors, behavioral finance, financial literacy, MiFID

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1 Introduction

Empirical research in behavioral finance mainly focus on objective attributes such as socio-demographic data and trading activities to characterize investors' portfolio choices or their exposure to biases. Such *objective* data are easy to elicit but may little capture psychological drivers that could affect the investor's decision-making process. By contrast, *subjective* data (i.e. financial literacy, risk-aversion, preferences and beliefs, etc.) are not directly observable and require the use of surveys and questionnaires. Economists are often reluctant to use such kind of data because of a priori skepticism: Can we trust what people state? Can we use this information to understand their behavior? According to Bertrand and Mullainathan (2001), this implicit distrust marks an important divide between economists and other social scientists. The latter audience is more prone to agree that subjective variables are useful in practice for understanding differences in behavior across individuals.

Despite the mentioned skepticism, the body of papers combining objective and subjective data to gain insights into investor's behavior is growing. When focusing on the self-assessment of financial literacy (referred to as *subjective* literacy hereafter), the literature is still scarce and reports mixed results. Dorn and Huberman (2005) find ambiguous evidence: investors who perceive themselves as more knowledgeable about financial securities display an objective higher literacy (i.e. they hold better diversified portfolios) but those who perceive themselves as better informed about financial securities than the average investor appear more overconfident (i.e. they churn their portfolios more). Van Rooij et al. (2011) report a very strong correlation between objective and subjective literacy and show that lack of literacy prevents from investing in stocks. Xia et al. (2014) use the difference between objective and subjective financial literacy scores as a proxy of overconfidence. They show that their overconfidence (underconfidence) measure is positively (negatively) correlated to stock market participation. By contrast to prior empirical evidence, Guiso and Jappelli (2008) find a weak correlation between objective and subjective literacy. Their findings suggest that subjective literacy is not really trustworthy because of overconfidence, especially for low-literate investors.

The use of subjective data for empirical research in finance deserves today more attention than ever because of the MiFID[1] regulation. Since November 2007, investment firms operating in the EU are forced to submit tests to their clients in order to determine their level of knowledge, their experience in complex instruments and their investment profile. Such tests should

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[1]MiFID stands for Markets in Financial Instruments Directive.

help offer investors suitable services accordingly. Specifically, MiFID requires a *Suitability test*, where the firm asks the investor some questions to reach an understanding of the types of investments that will be suitable for him, and an *Appropriateness test* in the framework of execution and submission of orders, which aims at assessing the experience in complex financial instruments to protect the investor who may not understand or be aware of the implications and level of risk involved in a "complex" transaction (i.e. involving "complex" financial products). Although MiFID tests are implemented for several years, they have raised little interest so far, both in academia and in the financial industry. The fact that such tests force investors to self-assess their financial literacy and report a lot of individual perceptions casts doubt on the meaningfulness of answers. To the best of our knowledge, no study has so far empirically investigated them and we fill the gap.

We think that this topic deserves attention as Marinelli and Mazzoli (2013) find evidence of huge heterogeneity in the quality of MiFID tests among Italian banks. In another paper, the same authors doubt that tests capture all the information to define suitability for clients. According to them, the information contained in the MiFID tests (that they have investigated) is not sufficient to determine the risk profile of an investor and thus the suitability of the financial instruments. Based on the portfolio of Italian households, they put forward new variables that are directly related to the risk-taking behavior of the households and that should be more integrated in the MiFID tests. Indeed, according to the authors, these variables are not sufficiently integrated in the design of the MiFID test that they study. While it doesn't mean that it is the case for all the MiFID tests, this evidence still feeds the debate around the quality of the MiFID tests as they are submitted by banks. Indeed the quality and relevance of the tests may vary across banks willingness and skill to submit relevant questionnaires given that these elements are not defined in the MiFID directive ("obligation of means").

In this paper, we assess the informative content of MiFID tests for characterizing retail investors' behavior. For this purpose, we use a unique database from an important online brokerage house to investigate the behavior of 23 366 retail investors during the 2000-2012 period. In particular, this database includes usual information relative to investors' orders and trades, but also their answers to both MiFID tests.[2] We focus on financial literacy assessment, which is the ultimate objective of both tests that should help investment firms elicit the degree of their clients' financial knowledge. In particular, we check the consistency between subjective financial literacy reported in the Suitability test and the one reported in the Appropriateness test. In a second step, we investigate the consistency between the responses provided by

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[2]The data are anonymized.

investors in MiFID tests and their actual behavior. Using ordered multinomial logit models, we relate subjective literacy or investment profile to a set of objective measures of sophistication.

The data at hand allow us to make a clear contribution to the literature since no study has so far investigated MiFID tests, which contain unique and relevant information for research in behavioral finance. In addition, this study is also meaningful for investment firms who are interested in better knowing how they could (better) manage information available in these tests to deliver the most suitable services to their retail clients. This study could also provide insights for regulatory purposes, in order to check whether the implemented tests are informative and useful to assess retail investors' financial knowledge.

Our main findings may be summarized as follows. As for self-assessment of financial literacy, our results reject independence across subjective measures available in both MiFID tests. They support consistency across investors'answers: investors who report a high literacy in the A-test are much more likely to also state a high literacy in the S-test. As for consistency between the answers provided by investors in MiFID tests and their actual trading behavior, we provide empirical evidence that investors displaying a higher objective sophistication are more likely to report a higher level of financial knowledge. In addition, we bring evidence of a positive relationship between objective literacy and investment profile: investors who display a sophisticated trading behavior are more likely to be characterized as *dynamic* or *aggressive.*

These findings support consistency between objective and subjective literacy, thereby suggesting that MiFID tests are really informative to characterize retail investors. Given their relevance, they may be useful for investment firms as well as for regulators in their concern to provide investors with suitable services. MiFID tests deserve definitively more attention in that perspective. Furthermore, the role of MiFID tests has been recently confirmed in the European regulation[3]. This makes our contribution even more relevant but it also open new areas of research to address to what extend opinions, perceptions and beliefs play a role in the individual's financial decision-making process.

The remainder of this paper is structured as follows. Section 2 describes our data and sample as well as the MiFID tests. We report our empirical work and its results in Section 3. Section 4 concludes.

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[3]With MiFID II (review of MiFID), the EU's regulation confirms the role of such tests by strengthening conduct rules such as an extended scope for the Appropriateness test and reinforced information to clients. For more details, go to the European Commission website.

2 Data and Sample

2.1 Data

The data are provided by an online brokerage house and cover the period from January 2000 to March 2012. They refer to 23 366 retail investors and are made of two datasets. The first one contains information about the investors, that we classify into three categories. The first category includes socio-demographic data: date of birth and gender. The second category encompasses the answers to the Appropriateness test while the third category contains the answers to the Suitability test. The second dataset is made of detailed information about the investors' trading activity. The online brokerage house provide them with an access to a large panel of financial instruments. The main are stocks, bonds, funds, options and warrants. Only futures cannot be directly traded on the common trading interface.[4] The data include an ID code for each instrument, order size, price, type, executed quantity, trade price, as well as a code for the market where the trade was completed.

2.2 MiFID tests

MiFID came into force in 2007 across the EU member states. One of its objectives was to increase the level of protection for investment firms' clients. In addition to client categorization aiming at segregating retail investors from professional investors and eligible counterparts, MiFID requires investment firms to qualify their clients and the services requested through Suitability and Appropriateness tests. These two levels of qualification depend on the type of services provided to the investor.

The Suitability test (S-test hereafter) has to be passed before providing investment advice or portfolio management. Assessment of suitability involves ensuring that the instruments and services offered meet the investor's objective, financial situation as well as his knowledge and experience in financial instruments. Basically, implementing the S-test mainly results in categorizing investors into four investment profiles: Conservative, Neutral, Dynamic or Aggressive. In this paper, our sample is made of 23 366 investors who asked for investment advice[5] and we have the responses to the S-test for each of them.

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[4]As a result, we do not have data about the trading activity on futures.

[5]The online brokerage house doesn't offer management services to its clients. It only provides an investment advice tool on stocks.

The Appropriateness test (A-test hereafter) has to be passed before providing execution and transmission of orders in complex financial instruments. Assessment of appropriateness mainly requires ensuring that the investor has the necessary experience and knowledge to understand the risks involved in complex financial instruments. In practice, the brokerage house that provides us with data has implemented this test in 2007 for an exhaustive list of instruments, including shares traded on a non-European market or on a European non-regulated market. As a result, we have the answers to the A-test for all the retail investors and our sample does not suffer from any selection bias.

We should stress that the answers to both MiFID tests are online decisions made by the investors, without personal intermediaries. Therefore answers are not affected by conversations with a broker. Moreover, investors are not necessary forced to fill in both tests at the same time (because they depend on different services). One shortcoming of our data is that they report neither the date at which the investor filled in the tests nor their potential updates.

2.3 Sample descriptive statistics

Tables 1 and 2 present descriptive statistics for our objective measures of financial literacy. In addition to both gender and age that are common control variables, we use direct measures of sophistication frequently used in the literature such as the total number of trades, the number of different stocks traded, or the number of different markets. All of them are usually viewed as good proxies of diversification and to a larger extent of financial literacy. Building on Boolell-Gunesh et al. (2012), we also consider whether investors trade other instruments than stocks, such as bonds, investment fund shares, or options and warrants. These types of instruments are assumed to require a higher financial literacy.[6] In addition, we look at new proxies such as the use of stop-loss orders. Indeed, stop-loss orders could help investors cut more rapidly their losses and thus reduce their exposure to the disposition effect,[7] as suggested in Shefrin (2007). The use of stop-loss orders is a measure of investor's both sophistication and awareness of his bias with losses.

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[6]Options and warrants are derivatives, which are usually considered as complex instruments. Investing in investment fund shares requires first funds screening and then selection according to the investor's profile and needs. Additionally, as stated by Guiso and Jappelli (2008), diversifying wealth through funds requires understanding diversification benefits and the risk properties of the assets pooled in the fund.

[7]Labeled initially by Shefrin and Statman (1984), this behavioral bias refers to investors' reluctance to realize losses (keep "losers") as well as their propensity to realize gains (sell "winners").

From Table 1, we know that the average investor is 48 years old in 2012 and executes a total of 157 trades across all instruments. When focusing on stocks, the average investor completes 74 trades on about 21 different stocks across 5 markets. He also trades stocks from 5 different nationalities or stocks of 2 different currencies. Counted on stocks, the average investor executes less than one stop-loss order. As for the other instruments, the average investor completes 27 trades on options or warrants, 11 trades on investment fund shares and less than 1 trade on bonds. His trading experience is about 68 months (that is 5.6 years). Table 1 exhibits quite similar mean and median values for age and trading experience, as well as for number of markets, nationalities or currencies. The first and third quartiles for each variable allow us to characterize heterogeneity among the sample.

Table 1: Descriptive statistics of objective measures of financial literacy (1)

	Mean	Median	Q1	Q3
Age_2012	48.48	48	38	58
Number of total trades	157.06	53	16	153
Number of stock trades	74	28	9	75
Number of stocks	21	12	5	26
Number of markets	5.2	5	3	7
Number of nationalities	5.2	5	3	7
Number of currencies	2.3	2	1	3
Number of option trades	27.08	0	0	1
Number of fund trades	11.82	0	0	2
Number of bond trades	0.26	0	0	0
Number of stop-loss orders	0.57	0	0	0
Trading experience (in months)	68	63	36	99

The table reports the cross-sectional mean, median, first and third quartile for age and direct measures of sophistication defined over the sample period. 'Age_2012' is computed in year 2012 using the available date of birth of each retail investor. 'Number of total trades' is the number of trades executed across all instruments. 'Number of stock trades' is the number of trades executed on stocks. 'Number of stocks' is the number of different stocks traded. 'Number of markets' is the number of different stock markets in which a retail investor has completed at least one trade. 'Number of nationalities' is the number of stocks of different nationalities traded. 'Number of currencies' is the number of stocks traded in different currencies. 'Number of option trades' is the number of trades executed on both options and warrants. 'Number of fund trades' is the number of trades executed on investment fund shares. 'Number of bond trades' is the number of trades executed on bonds. 'Number of stop-loss orders' is the number of stop-loss orders executed on stocks. 'Trading experience' is computed as the difference between the last trade date and the first trade date available in the sample. It is expressed in number of months.

Table 2 shows statistics computed on binary variables. 90% of the investors are men in our sample. As for asset allocation, 33% of them trade investment fund shares, 30% of them already trade options or warrants but only 8% of them trade bonds. About 10% of the investors use stop-loss orders. These figures appear consistent with the statistics reported in Table 1.

Table 2: Descriptive statistics of objective measures of financial literacy (2)

	0	1
Gender	10%	90%
Bonds_trader	92%	8%
Funds_trader	67%	33%
Options_trader	70%	30%
Stop_loss_user	90%	10%

The table reports statistics for gender and direct measures of sophistication built on binary variables. 'Gender' is equal to 1 for men. 'Bonds_trader' is set to 1 when the investor made at least one trade on bonds. 'Funds_trader' is set to 1 when the investor made at least one trade on investment fund shares. 'Options_trader' is set to 1 when the investor made at least one trade on either options or warrants. 'Stop_loss_user' is set to 1 when the investor executed at least one stop-loss order on stocks.

In the MiFID tests, we use answers to several items requiring self-assessment of financial knowledge as subjective measures of financial literacy. In addition, we consider the investment profile, which is assigned to an investor based on the total score at the S-test. This profile is not chosen by the investor but it directly depends on the answers given in the S-test. Subjective literacy contributes therefore to the profile selection.

Statistics for subjective literacy and investment profile are provided in Table 3. In Panel A, we observe again a real heterogeneity among investors for both 'knowledge of financial markets' and 'number of orders'. Unsurprisingly, responses to both items are correlated. Only 11% of the investors consider themselves as a really experienced investor in the A-test. As for the education level, more than 75% of the investors report a university or equivalent degree. In Panel B, the empirical frequencies for 'knowledge of financial markets' seem to be somewhat consistent with those observed in the A-test for the similar item. Only 9% of the investors view themselves as a very experienced investor in the S-test. And less than 3% of the investors report that they know very little about financial markets. The last item in Panel B covers both knowledge and experience about "complex" instruments. More than 55% (29%) of the investors consider they have an average (a good) knowledge. Only a minority (15%) of the

investors report an absence of knowledge and experience. Panel C exhibits the investment profile depending on the S-test score. More than 60% of the investors who filled in the test are characterized as dynamic while less than 3% are conservative.

Table 3: Descriptive statistics for some answers to both MiFID tests

Panel A: A-test items	0	1	2	3	
Knowledge of financial markets	19.45%	28.65%	40.86%	11.05%	
Number of orders per year on "complex" instruments	23.10%	37.38%	26.81%	12.71%	
Highest education degree	4.59%	20.30%	75.11%		
Panel B: S-test items	1	2	3	4	5
Knowledge of financial markets	2.81%	14.99%	30.35%	42.98%	8.87%
Knowledge and experience about "complex" instruments	15.15%	55.30%	29.54%	-	-
Panel C: S-test score	Conservative	Neutral	Dynamic	Aggressive	
Investment Profile	2.41%	22.52%	62.05%	13.02%	

The table reports the empirical frequencies for the items of the MiFID tests dealing with financial literacy. In Panel A and B, the self-assessment scale is increasing. In Panel A, for 'Knowledge of financial markets', the level 0 is associated with a basic knowledge while the level 3 refers to an experienced investor who manages any aspect of the financial markets. For the 'Number of orders per year on "complex" instruments', the item covers only the products listed for the A-test and the level 0 is associated with zero order while the level 3 refers to more than 36 orders. As for 'Highest education degree', the level 0 corresponds to no degree, the level 1 to secondary or high school degree, and the level 2 to university or equivalent degree. There is no third level for this item. In Panel B, for the 'Knowledge of financial markets', the lowest level is associated with an investor who knows very little while the highest level refers to someone who considers oneself as an experienced investor. As for 'Knowledge and experience about "complex" instruments', the lowest level corresponds to "No knowledge" while the highest level refers to "Good knowledge". There is only three levels available for this last item. In Panel C, we report the investment profiles depending on the S-test score. We give the empirical distribution among the four possible profiles.

3 Empirical work

3.1 Consistency across investors' answers in both MiFID tests

As mentioned earlier, investors do not necessary fill in both tests at the same time. This leads us to assess the consistency across their answers for similar items in both tests. For this purpose, we use contingency tables wherein unconditional and conditional empirical frequencies are reported. We focus on self-reported financial knowledge and provide the results in Table 4.

Based on the χ^2 statistic,[8] we can reject the null hypothesis of independence between the two subjective measures of financial literacy. Comparing unconditional to conditional frequencies, an investor who reports a high literacy in the A-test is much more likely to mention also a high financial knowledge in the S-test.

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[8] $\chi^2 = \sum_i \sum_j \frac{(n_{ij} - \frac{n_i n_j}{n})^2}{\frac{n_i n_j}{n}}$ where the degree of freedom is $(r-1)(c-1)$ with r the number of rows and c the number of columns.

Table 4: Subjective financial literacy in the A-test vs. in the S-test

A-test		S-test					
		1	2	3	4	5	Total
0	(#)	187	2275	1221	776	85	4544
	(%)	0.80	9.74	5.23	3.32	0.36	19.45
	(r%)	4.12	50.07	26.87	17.08	1.87	
	(c%)	28.46	64.96	17.22	7.73	4.10	
1	(#)	215	923	3372	2062	122	6694
	(%)	0.92	3.95	14.43	8.82	0.52	28.65
	(r%)	3.21	13.79	50.37	30.80	1.82	
	(c%)	32.72	26.36	47.55	20.53	5.89	
2	(#)	181	275	2274	6201	616	9547
	(%)	0.77	1.18	9.73	26.54	2.64	40.86
	(r%)	1.90	2.88	23.82	64.95	6.45	
	(c%)	27.55	7.85	32.06	61.75	29.72	
3	(#)	74	29	225	1003	1250	2581
	(%)	0.32	0.12	0.96	4.29	5.35	11.05
	(r%)	2.87	1.12	8.72	38.86	48.43	
	(c%)	11.26	0.83	3.17	9.99	60.30	
Total	(#)	657	3502	7092	10042	2073	23366
	(%)	2.81	14.99	30.35	42.98	8.87	100.00

Statistics	Value	P-value
χ^2	13760.7	<.0001
Spearman's rank correlation	0.55	<.0001

This contingency table reports respectively, for each pair of responses, the empirical frequencies (#), the total percentages (%), the row percentages (r%) and the column percentages (c%). Responses for the A-test are positioned in rows while those for the S-test are in columns. In the A-test, the level 0 is associated with a basic knowledge while the level 3 refers to an experienced investor who manages any aspect of the financial markets. In the S-test, the lowest level is associated with an investor who knows very little while the highest level refers to someone who considers oneself as an experienced investor. The results for the Chi-Square test for the null hypothesis of independence is also provided as wells as the results for the Spearman's rank correlation to study the correlation between the responses for the two items.

We also provide the result for the Spearman's rank correlation to investigate the correlation between the responses for the two items. Indeed this type of correlation is suitable for ordinal variables. As we can see, the correlation has a value of 0.55 and is highly significant, which suggests relatively high level of consistency between the responses provided in the two items.

Table 5 displays unconditional and conditional empirical frequencies for another combination of similar items: the self-reported financial knowledge in the A-test and the self-reported knowledge and experience about "complex" instruments in the S-test. The findings are consistent and support the consistency across investors'answers in both tests.

Table 5: Subjective financial literacy in the A-test vs. in the S-test

A-test		S-test			
		0	1	2	Total
0	(#)	1847	2392	305	4544
	(%)	7.90	10.24	1.31	19.45
	(r%)	40.65	52.64	6.71	
	(c%)	52.16	18.51	4.42	
1	(#)	1026	4854	814	6694
	(%)	4.39	20.77	3.48	28.65
	(r%)	15.33	72.51	12.16	
	(c%)	28.97	37.56	11.79	
2	(#)	554	5241	3752	9547
	(%)	2.37	22.43	16.06	40.86
	(r%)	5.80	54.90	39.30	
	(c%)	15.65	40.56	54.35	
3	(#)	114	435	2032	2581
	(%)	0.49	1.86	8.70	11.05
	(r%)	4.42	16.85	78.73	
	(c%)	3.22	3.37	29.44	
Total	(#)	3541	12922	6903	23366
	(%)	15.15	55.30	29.54	100.00

Statistic	Value	P-value
χ^2	7658.219	<.0001
Spearman's rank correlation	0.51	<.0001

This contingency table reports respectively, for each pair of responses, the empirical frequencies (#), the total percentages (%), the row percentages (r%) and the column percentages (c%). Responses for the A-test are positioned in rows while those for the S-test are in columns. In the A-test, the level 0 is associated with a basic knowledge while the level 3 refers to an experienced investor who manages any aspect of the financial markets. In the S-test, we consider here the item 'Knowledge and experience about "complex" instruments'. The lowest level corresponds to "No knowledge" while the highest level refers to "Good knowledge". The results for the Chi-Square test for the null hypothesis of independence is also provided as wells as the results for the Spearman's rank correlation to study the correlation between the responses for the two items.

The Spearman's rank correlation has a value of 0.51 and is highly significant. It suggests relatively high level of consistency between the responses provided in the two items.

3.2 Consistency between subjective literacy and actual behavior

We investigate the consistency between subjective financial literacy and actual behavior using two ordered multinomial logit models. In both models, the dependent variable is a subjective measure of financial literacy while the set of explanatory variables is made of our objective measures of literacy presented in the subsection 2.3. Each model is specified as follows: $Y_i^* = X_i\beta + \epsilon_i$, with

$$Y_i = \begin{cases} k & \text{if} & Y_i^* \leq \mu_0 \\ k+1 & \text{if} & \mu_0 \leq Y_i^* \leq \mu_1 \\ k+n & \text{if} & Y_i^* > \mu_{n-k} \end{cases}$$

and where Y_i is the self-reported subjective literacy ranging from level k to level $k + n$, Y_i^* is the unobserved subjective literacy, X_i is the vector of explanatory variables, β is a vector of coefficients, μ_i are the threshold parameters to be estimated along with β, and ϵ is a disturbance term assumed to follow a noram distribution.

In the first model, we use the financial literacy reported in the A-test as dependent variable, which is scaled across 4 levels. Table 6 reports the average marginal effects (AMEs). A positive AME of x% for a specific level means that a one unit increase of the explanatory variable value increases the likelihood by x% that the investor chooses that level. AMEs for our objective measures of literacy increase in value across levels, even if some are very low. To be noticed that all the AMEs are significant at the $<.0001$. AMEs are the most striking for investors who have already traded options or warrants: compared to other investors, the probability they report a high literacy (level 3 or 4 on the scale) increases by about 23%. To a weaker extent, this also holds for respectively investors who trade funds, investors who trade bonds, and investors who executes stop-loss orders.

Table 6 also shows that men are more likely than women to report a high literacy.

Finally, we provide some goodness of fit measures. The MacFadden's pseudo r^2 takes into account the log-likelihood of the full logit model (with all the explaining variables) and the log-likelihood of the intercept-only model. The Somer's D index is used to determine the strengh

and direction of relation between pairs of variables. Its value ranges from -1 (all pairs disagree) to 1 (all pairs agree). It equals the difference between the percent concordant and the percent discordant divided by 100. (The percent (dis)concordant compares for each observation, the observed value with the value predicted by the model). C is another measure of rank correlation of ordinal variables. It's a variant of Somer's D index and ranges from 0 (no association) to 1 (perfect association).

Our findings suggest that investors displaying a higher objective sophistication are more likely to report a higher level of financial knowledge, which supports consistency between objective and subjective literacy.

Table 6: Self-reported financial literacy and actual behavior

Self-reported literacy (A-test)	AME for level 0	AME for level 1	AME for level 2	AME for level 3
Gender	-3.94%	-1.97%	3.46%	2.45%
Age_2012	-0.09%	-0.04%	0.08%	0.05%
Trading experience	-0.08%	-0.04%	0.07%	0.05%
Log(number_stocks)	-0.73%	-0.37%	0.65%	0.46%
Funds_trader	-5.81%	-2.91%	5.11%	3.61%
Options_trader	-15.66%	-7.86%	13.78%	9.74%
Stop_loss_user	-1.93%	-0.97%	1.69%	1.20%
Bonds_trader	-4.43%	-2.22%	3.90%	2.76%
Goodness of fit measure	Value			
MacFadden's pseudo r^2	5.5%			
Somer's D index	33.4%			
C	66.6%			

This table reports the average marginal effects (AMEs) for the logit model wherein the dependent variable is the financial literacy reported in the A-test. The level 0 is associated with a basic knowledge while the level 3 refers to an experienced investor who manages any aspect of the financial markets. 'Gender' is equal to 1 for men. 'Age_2012' is computed in year 2012 using the available date of birth of each retail investor. 'Log(number_stocks)' is the logarithm of the number of different stocks traded. 'Trading experience' is computed as the difference between the last trade date and the first trade date available in the sample. It is expressed in number of months. 'Bonds_trader' is set to 1 when the investor made at least one trade on bonds. 'Funds_trader' is set to 1 when the investor made at least one trade on investment fund shares. 'Options_trader' is set to 1 when the investor made at least one trade on either options or warrants. 'Stop_loss_user' is set to 1 when the investor executed at least one stop-loss order on stocks. This table also reports goodness of fit measures: MacFadden's pseudo r^2, Somer's D index and C.

Table 7 reports the results for the second model wherein we use as dependent variable the knowledge and experience in complex instruments reported in the S-test, which is scaled across 3 levels. The findings are consistent with the previous ones. The highest level of literacy is more likely to be chosen by investors who have already traded options or warrants, or investment fund shares, or bonds. The probability to select this highest level of literacy increases by 4% for men. Overall, the results suggest again consistency between objective and subjective literacy.

Table 7: Self-reported financial literacy in complex instruments and actual behavior

Knowledge and experience (S-test)	AME for level 1	AME for level 2	AME for level 3
Gender	-2.67%	-1.40%	4.08%
Age_2012	-0.07%	-0.04%	0.11%
Trading experience	-0.06%	-0.03%	0.09%
Log(number_stocks)	-0.63%	-0.33%	0.96%
Funds_trader	-4.90%	-2.58%	7.48%
Options_trader	-11.92%	-6.26%	18.18%
Stop_loss_user	-0.62%	-0.33%	0.95%
Bonds_trader	-4.10%	-2.15%	6.25%
Goodness of fit measure	Value		
MacFadden's pseudo r^2	5.8%		
Somer's D index	33.5%		
C	66.8%		

This table reports the average marginal effects (AMEs) for the logit model wherein the dependent variable is the 'Knowledge and experience about "complex" instruments' in the S-test. The lowest level corresponds to "No knowledge" while the highest level refers to "Good knowledge". 'Gender' is equal to 1 for men. 'Age_2012' is computed in year 2012 using the available date of birth of each retail investor. 'Log(number_stocks)' is the logarithm of the number of different stocks traded. 'Trading experience' is computed as the difference between the last trade date and the first trade date available in the sample. It is expressed in number of months. 'Bonds_trader' is set to 1 when the investor made at least one trade on bonds. 'Funds_trader' is set to 1 when the investor made at least one trade on investment fund shares. 'Options_trader' is set to 1 when the investor made at least one trade on either options or warrants. 'Stop_loss_user' is set to 1 when the investor executed at least one stop-loss order on stocks. This table also reports goodness of fit measures: MacFadden's pseudo r^2, Somer's D index and C.

3.3 Consistency between investment profile and actual behavior

To investigate the relationship between investment profile and actual behavior, we use another ordered multinomial logit model wherein the dependent variable is the investment profile. Therefore the response variable Y_i captures the probability that investor i falls in the category k among the 4 possible profiles, that are respectively conservative, neutral, dynamic, or aggressive. As mentioned earlier, these profiles directly depend on an increasing score at the S-test. The set of explanatory variables is still made of our objective measures of financial literacy presented in the subsection 2.3.

Results are provided in Table 8. AMEs increase in value across levels for most of our objective measures of literacy, even if several are close to zero. Again, AMEs are the most striking for investors who have already traded options or warrants: compared to other investors, they are more likely to be flagged as dynamic or aggressive. To a weaker extent, this also holds for investors who trade funds.

Table 8 also shows that men are more likely than women to be characterized as dynamic or aggressive.

Table 8: Investment profile and actual behavior

Investment profile	AME for Conservative	AME for Neutral	AME for Dynamic	AME for Aggressive
Gender	-0.67%	-4.44%	1.97%	3.14%
Age_2012	0.00%	0.01%	-0.01%	-0.01%
Trading experience	-0.01%	-0.07%	0.03%	0.05%
Log(number_stocks)	-0.36%	-2.40%	1.06%	1.69%
Funds_trader	-0.66%	-4.41%	1.96%	3.11%
Options_trader	-1.14%	-7.63%	3.39%	5.39%
Stop_loss_user	0.19%	1.28%	-0.57%	-0.90%
Bonds_trader	-0.15%	-1.03%	0.46%	0.72%
Goodness of fit measure	Value			
MacFadden's pseudo r^2	3.1%			
Somer's D index	25.7%			
C	62.8%			

This table reports the average marginal effects (ME) for the logit model wherein the dependent variable is the investment profile. The investment profile is defined as the outcome of the S-test. 'Gender' is equal to 1 for men. 'Age_2012' is computed in year 2012 using the available date of birth of each retail investor. 'Log(number_stocks)' is the logarithm of the number of different stocks traded. 'Trading experience' is computed as the difference between the last trade date and the first trade date available in the sample. It is expressed in number of months. 'Bonds_trader' is set to 1 when the investor made at least one trade on bonds. 'Funds_trader' is set to 1 when the investor made at least one trade on investment fund shares. 'Options_trader' is set to 1 when the investor made at least one trade on either options or warrants. 'Stop_loss_user' is set to 1 when the investor executed at least one stop-loss order on stocks. This table also reports goodness of fit measures: MacFadden's pseudo r^2, Somer's D index and C.

To be noticed that results for the investment profile are less economically significant than results for the subjective financial literacy. This can be explained by the fact that our explaining variables only capture one aspect (the financial literacy) of the elements that allow the determination of the investment profile. Indeed besides the financial literacy, other elements such as the loss-version, the investment horizon, ... are taken into account to determine the investment profile.

3.4   Robustness check

As robustness check, to control for potential bias regarding investors that began to trade before the fulfilling of MiFID tests (potential learning effect), we replicate the tests for a subsample of investors that began to trade after the implementation of MiFID tests (2008).

The subsample is made of 9455 investors who realized their first trade (whatever the financial instruments) after 2008.

As for the contingency table between the subjective financial literacy in the A-test and in the S-test, the independence hypothesis is always strongly rejected and the Spearman's rank correlation 0.58 with a p-value of < 0.001. As for the contingency table between the self-reported financial knowledge in the A-test and the self-reported knowledge and experience about "complex" instruments in the S-test, the independence hypothesis is always strongly rejected and the Spearman's rank correlation 0.52 with a p-value of < 0.001[9].

As for the ordered logit models, the results are displayed in the three following tables.

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[9]Tables can be provided upon request

Table 9: Robustness check: Self-reported financial literacy and actual behavior

Self-reported literacy (A-test)	AME for level 0	AME for level 1	AME for level 2	AME for level 3
Gender	-5.79%	-0.68%	4.69%	1.78%
Age_2012	-0.29%	-0.03%	0.24%	0.09%
Trading experience	0.13%	0.02%	-0.11%	-0.04%
Log(number_stocks)	-0.20%	-0.02%	0.16%	0.06%
Funds_trader	-6.40%	-0.75%	5.19%	1.97%
Options_trader	-19.61%	-2.31%	15.89%	6.03%
Stop_loss_user	-4.35%	-0.51%	3.52%	1.34%
Bonds_trader	-8.25%	-0.97%	6.68%	2.54%
Goodness of fit measure	Value			
MacFadden's pseudo r^2	2.6%			
Somer's D index	22.4%			
C	61.2%			

This table reports the average marginal effects (AMEs) for the logit model wherein the dependent variable is the financial literacy reported in the A-test for the subsample of investors that began to trade after 2008. The level 0 is associated with a basic knowledge while the level 3 refers to an experienced investor who manages any aspect of the financial markets. 'Gender' is equal to 1 for men. 'Age_2012' is computed in year 2012 using the available date of birth of each retail investor. 'Log(number_stocks)' is the logarithm of the number of different stocks traded. 'Trading experience' is computed as the difference between the last trade date and the first trade date available in the sample. It is expressed in number of months. 'Bonds_trader' is set to 1 when the investor made at least one trade on bonds. 'Funds_trader' is set to 1 when the investor made at least one trade on investment fund shares. 'Options_trader' is set to 1 when the investor made at least one trade on either options or warrants. 'Stop_loss_user' is set to 1 when the investor executed at least one stop-loss order on stocks. This table also reports goodness of fit measures: MacFadden's pseudo r^2, Somer's D index and C.

Table 10: Self-reported financial literacy in complex instruments and actual behavior

Knowledge and experience (S-test)	AME for level 1	AME for level 2	AME for level 3
Gender	-1.12%	0.09%	1.03%
Age_2012	-0.21%	0.02%	0.19%
Trading experience	0.17%	-0.01%	-0.16%
Log(number_stocks)	-0.93%	0.08%	0.86%
Funds_trader	-5.21%	0.44%	4.77%
Options_trader	-16.30%	1.37%	14.93%
Stop_loss_user	-0.71%	0.06%	0.65%
Bonds_trader	-5.43%	0.46%	4.97%
Goodness of fit measure	Value		
MacFadden's pseudo r^2	3%		
Somer's D index	23.8%		
C	61.9%		

This table reports the average marginal effects (AMEs) for the logit model wherein the dependent variable is the 'Knowledge and experience about "complex" instruments' in the S-test for the subsample of investors that began to trade after 2008. The lowest level corresponds to "No knowledge" while the highest level refers to "Good knowledge". 'Gender' is equal to 1 for men. 'Age_2012' is computed in year 2012 using the available date of birth of each retail investor. 'Log(number_stocks)' is the logarithm of the number of different stocks traded. 'Trading experience' is computed as the difference between the last trade date and the first trade date available in the sample. It is expressed in number of months. 'Bonds_trader' is set to 1 when the investor made at least one trade on bonds. 'Funds_trader' is set to 1 when the investor made at least one trade on investment fund shares. 'Options_trader' is set to 1 when the investor made at least one trade on either options or warrants. 'Stop_loss_user' is set to 1 when the investor executed at least one stop-loss order on stocks. This table also reports goodness of fit measures: MacFadden's pseudo r^2, Somer's D index and C.

Table 11: Investment profile and actual behavior

Investment profile	AME for Conservative	AME for Neutral	AME for Dynamic	AME for Aggressive
Gender	-0.43%	-4.67%	3.29%	1.81%
Age_2012	-0.03%	-0.34%	0.24%	0.13%
Trading experience	0.01%	0.10%	-0.07%	-0.04%
Log(number_stocks)	-0.39%	-4.26%	3.00%	1.65%
Funds_trader	-0.46%	-4.95%	3.49%	1.92%
Options_trader	-0.83%	-8.93%	6.29%	3.47%
Stop_loss_user	0.01%	0.11%	-0.07%	-0.04%
Bonds_trader	0.14%	1.49%	-1.05%	-0.58%
Goodness of fit measure	Value			
MacFadden's pseudo r^2	2.61%			
Somer's D index	24.6%			
C	62.3%			

This table reports the average marginal effects (ME) for the logit model wherein the dependent variable is the investment profile for the subsample of investors that began to trade after 2008. The investment profile is defined as the outcome of the S-test. 'Gender' is equal to 1 for men. 'Age_2012' is computed in year 2012 using the available date of birth of each retail investor. 'Log(number_stocks)' is the logarithm of the number of different stocks traded. 'Trading experience' is computed as the difference between the last trade date and the first trade date available in the sample. It is expressed in number of months. 'Bonds_trader' is set to 1 when the investor made at least one trade on bonds. 'Funds_trader' is set to 1 when the investor made at least one trade on investment fund shares. 'Options_trader' is set to 1 when the investor made at least one trade on either options or warrants. 'Stop_loss_user' is set to 1 when the investor executed at least one stop-loss order on stocks. This table also reports goodness of fit measures: MacFadden's pseudo r^2, Somer's D index and C.

In general the results remain the same as for the entire sample.

4 Conclusion

Recently, questionnaires have gained importance in financial research as they allow to collect data on subjective matters (i.e. loss-aversion, risk-aversion, financial literacy, preferences and beliefs, etc.) that are known to play a significant role in the decision-making of investors. However some authors remain skeptical about the use of questionnaires and surveys, putting forward doubts on their reliability. The question surrounding the reliability of questionnaires

needs to be addressed as today MiFID Regulation requires investment firms to provide suitable services to their clients; these services being defined in accordance with the clients' answers to the two MiFID tests.

In this paper, we address the informative content of MiFID tests in order to answer the questions "Can investment firms trust the answers provided in these tests?", "Are the answers provided by an investor consistent with his actual behavior?".

To assess to what extent MiFID tests are informative, we check, in a first step, the consistency across the responses provided by investors in both tests. In particular, we examine the consistency between the two versions of self-reported financial literacy and we evaluate the consistency between the investment profile and the self-reported financial literacy (in both versions).

In a second step, we investigate the consistency between the responses provided by investors in MiFID tests and their actual behavior.

As for the consistency across the responses provided by investors in both MiFID tests, we reject in each case independence and report strong measures of association between the responses self-reported by investors in the Suitability test and in the Appropriateness test. In particular, we find a high level of consistency between the two versions of self-reported financial literacy. In addition, we also find a high level of consistency between the investment profile (based on the investor's score at the Suitability test) and the self-reported financial literacy (in both versions).

As for the consistency between the responses provided by investors in MiFID tests and their actual trading behavior, we find overall high level of consistency between direct proxies of financial sophistication ("objective" literacy) and financial literacy self-reported by investors through tests ("subjective" literacy). These findings suggest that MiFID tests are really informative to characterize retail investors. Given their relevance, they may be useful for investment firms as well as for regulators in their concern to provide investors with suitable services. MiFID tests deserve definitively more attention in that perspective.

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