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The investor in structured retail products: Advice driven or gambling oriented?

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ABSTRACT

Structured retail products (SRP) are one of the most visible faces of financial innovation and are becoming increasingly popular amongst retail investors. However, there is strong consensus that retail investors' preference for structured products is difficult to explain using the standard rational theory, those products being in general sold at a significant premium. Studying the actual trading behavior of individual investors we provide evidence consistent with the view that SRP likely offer value to some informed investors compared to other products, and that SRP allow investors to access segments otherwise not available to them. Nonetheless, our results also suggest that the increasing popularity of SRP is deeply related to investors' behavioral biases, particularly overconfidence and gambling.

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1. Introduction

Structured retail products (SRP) are one of the most visible faces of financial innovation and are increasingly popular amongst retail investors. The number of SRP issued in Europe has been rising in recent years, reaching more than 850,000 in 2011. However, it is by now well established that these products are generally sold at a significant premium. Bergstresser (2008), Bernard et al. (2010), Grünbichler and Wohlwend (2005), Henderson and Pearson (2011), Jørgensen et al. (2011), Szymanowska et al. (2009), Wallmeier and Diethelm (2009), among others, address the subject of the pricing of different SRP in different markets and contexts and conclude that these products are persistently overpriced.

Some arguments have been put forward that might justify the rationality of the increased retail demand for SRP. The low interest rate environment creates incentives to search for yield (Kiriakopoulos and Mavralexakis, 2011), and structured products

that promise a high maximum return may be purchased. SRP's ability to offer exposure on some asset classes and market segments that are otherwise not available for retail investors (Schneider and Giobanu, 2010), as well as taxation (Nicolaus, 2010) and lower transaction costs (Entrop et al., 2016a,b), may also foster demand.

However, many other researchers claim that investors' preferences to SRP depart from the standard rational expectations theory. It is the case of, for example, Henderson and Pearson (2008), Hens and Rieger (2011), Nicolaus (2010), Szymanowska et al. (2009), Vanini and Dobeli (2010) and Entrop et al. (2016a). As Henderson and Pearson (2008) put it, "it is difficult to rationalize investor demand for structured equity products within any plausible normative model of the behavior of rational investors". In this line of research, we think that the increasing popularity of SRP can be better explained by behavioral factors like the mental accounting bias, overconfidence or desire for gambling. Das and Statman (2012) argue that SRP can help improve portfolio allocation for investors with a mental accounting bias. According to this behavioral perspective, portfolios are composed of mental account sub-portfolios, each associated with a particular objective. Investors optimize each mental account by finding the assets and the asset allocation that maximize the expected return of each mental account sub-portfolio, such as retirement income or bequest. Some

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other behavioral biases may also explain the over investment in SRP, like investors' overconfidence or love for gambling. Overconfident investors have been associated with excessive risk taking (Dorn and Huberman, 2005; Nasic and Weber, 2010), that meaning they are more prone to take on risk for which there is no apparent reward and consequently more prone to invest in SRP. Similarly, recent research postulates that some individual investors view trading in the stock market as an opportunity to gamble. For instance, Barber et al. (2009) document that the introduction of the government-sponsored lottery in Taiwan did reduce the stock market turnover by about a quarter, apparently showing that part of the excessive trading of individual investors is motivated by their gambling desire.

Related to this literature, recent works on individual financial literacy seem to show that the higher the individual financial knowledge, the more efficient and rational will be her/his financial behavior, such as planning and saving for retirement (Lusardi and Mitchell, 2009), investing in the stock market (Christelis et al., 2010) or diversifying portfolio (Abreu and Mendes, 2010).

Another stream of literature emphasizes the marketing strategies as the main reason for the increasing popularity of SRP. But, how do issuers and distributors convince retail investors to buy these persistently overpriced structured products? Quite often, the selling pressure imposed by financial intermediaries conditions the distribution of SRP, thus influencing the demand. Aggressive marketing or financial advice is not uncommon because financial intermediaries' profits from SRP are higher than profits from other products (Kiriakopoulos and Mavralexakis, 2011). Chang et al. (2010) reports that financially illiterate retail investors are in essence pulled by product distributors regardless of the product's costs. Sometimes SRP offer capital protection and this may allow high risk aversion investors to invest in these products by looking only at the potential upside of returns. The literature produced on the subject focuses on investors' misperception of the enclosed risks (Kunz et al., 2017) and on the poor ex-post performance of SRP. In fact, the retail investor may not have the expertise to understand the complexities of these products, to compute or estimate the probabilities of the different pay-offs of the products, and misunderstands them. Issuing firms, on the other hand, may introduce complexity to exploit uninformed (Henderson and Pearson, 2011; Célérier and Vallée, 2013) or naïve investors (Campbell, 2006) and to extract consumer surplus (Carlin and Manso, 2009), and as a result are able to overprice them.

In the United States, the Securities and Exchange Commission (SEC, 2011) issued a report that summarizes the results of an examination of the retail structured products placed by several broker-dealers. It was concluded that "*sales of structured products to retail investors ... may continue to increase as they are marketed as a higher return investment alternative*" and that broker-dealers might have recommended unsuitable structured securities products to retail investors and traded at prices disadvantageous to retail investors.

In spite of the increased relevance of SRP for retail investors, little is known regarding the profile of those most likely to invest in these complex financial instruments and there is little evidence on the real impact of bank advice or of overconfidence and the desire for gambling on the trading of SRP. In this paper we will study these questions with the help of a proprietary dataset of one of the largest Portuguese financial intermediaries which documents the history of individual investors' trades in securities over more than a decade. The information in the database includes detailed socio-economic and financial information on individual investors who traded in securities at least once over the period January 1997–April 2011.

In this context, this study contributes to characterizing the profile of individual (i.e., non-institutional) investors in SRP. Using

data from the Portuguese market, this paper aims to answer the following questions: What are the main socio-demographic characteristics of SRP investors? What is the influence of some investors' behavioral biases (overconfidence and gambling) in characterizing the investor in SRP? What is the impact of bank advice on the sale of these products? Does the level of investors' financial literacy have any influence on SRP trading activity?

This paper contributes to the existing literature on structured retail products in some important aspects. Firstly, the design of our research combines actual trading behavior of individual investors with a survey of individual investors conducted by a securities regulator. Secondly, as far as we know this is the first study that analyzes whether investors in SRP are different than other investors, thus filling a gap in the academic literature. Thirdly, and more important, we test the validity of some theoretical hypotheses put forth to explain the investment in SRP by retail investors. It is the case of bank advice, overconfidence and gambling.

We start out documenting that investors in SRP have different socio-demographic characteristics than investors in other financial instruments. We then test the impact of financial literacy on the investment in SRP and conclude that more knowledgeable and sophisticated investors are more likely to invest in SRP. This is consistent with the idea that more complex structured products likely offer value to more knowledgeable and sophisticated retail investors. We also conclude that overconfident investors participate (and trade) more in the structured retail product market, and that the contact between the product distributor and the investor is most relevant. Finally, our results allow us to conclude that the search for gambling may justify investors' decision when they opt for SRP.

The study is structured as follows: The next section describes the database used. The third section traces the socio-demographic profile of investors in SRP, making a comparison with equity investors and the general Portuguese population. In Section 4 alternative models are estimated to help define the profile of investors in SRP and evaluate the influence of behavioral traits in this characterization. In the last section some final conclusions are drawn.

2. The database

The main database used in this study contains information from one of the top five Portuguese banks. The information relates to the accounts of individual investors that were active in late April 2011² and includes socio-demographic data (marital status, birth date, gender, education, occupation and residence) on the first account holder and on the existence (or nonexistence) of deposits, consumer loans and mortgages associated with the account holders. In addition, we obtained information on all transactions in financial instruments linked to these accounts for the period 02/January/1997 to 30/April/2011, including the date of the transaction, the transaction type (purchase or sale), the ISIN code of the financial instrument, the quantity traded and at what price. For a comparison with the corresponding characteristics in the Portuguese population data from the 2005 INE Statistical Yearbook and the 2001 Census are used.

A different database is also used. It comes from a survey conducted by CMVM (the Portuguese Securities Commission) to identify the characteristics of individual Portuguese investors.³ The

² In general, investors and depositors do not formally close their bank accounts; when they do not want to continue their banking relationship with a certain bank, they just bring their balance and portfolio down to zero. This characteristic of investors alleviates any potential concerns with survivorship bias.

³ The survey identifies an investor in securities as one holding one or more of the following assets: stocks, bonds, mutual funds, participation certificates and derivatives.

Table 1
Socio-demographic characterization of investors (%).

	SRP	Investors	Portugal
1.1. Age groups ^a			
25–34	5.9	14.2	21.3
35–44	18.6	19.9	20.5
45–54	21.9	20.4	18.6
55–64	21.6	19.7	15.8
65–74	17.1	14.6	13.1
75–84	11.6	8.5	8.4
>84	3.3	2.7	2.2
Total	100	100	100
1.2. Marital status			
Married ^b	68.9	67.1	69.8 ^c
Other	31.1	32.9	30.2 ^c
1.3. Area of residence			
Porto	26.9	13.5	10.4
Lisbon	21.5	26.9	21.0
Rest of the country	51.6	59.6	68.6
1.4. Professional status			
Senior management ^d	35.2	17.4	5.9
Specialists ^e	21.2	20.5	10.4
White collar ^f	22.5	15.8	14.2
Blue collar ^g	12.3	16.7	29.9
Inactive ^h	8.7	29.6	39.6
1.5. Education ⁱ			
15–24	6.4	18.7	3.6
25–34	26.0	35.2	19.1
35–44	27.9	35.6	12.7
45–54	19.8	30.0	10.2
>54	10.3	18.9	4.8

^a Over 25 years of age.^b With and without civil registry.^c In relation to the population over 15.^d Upper levels of public administration, directors and business managers.^e Specialists in science, physics, mathematics, engineering, health, professors, etc.^f Office workers and similar.^g Farmers, industrial workers, mechanics and non-qualified workers.^h Retired, unemployed, students.ⁱ Proportion of individuals within each age group who have completed a college degree.

most recent one was conducted in 2000, and was publicly released in May 2005 on the CMVM website. More than fifteen thousand individuals were contacted between 2 October and 22 December 2000 using the direct interview technique. These individuals were responsible or co-responsible for family investment decisions. 1559 investors in securities were identified. All of these investors were interviewed using a structured questionnaire.⁴ Each questionnaire included socio-economic questions, questions related to the nature and type of the assets held⁵ and investor experience, as well as questions related to trading behavior (frequency of transactions, acquisition of information, etc.) and to investors' information about markets and their agents, and sources of information used. We use this database to compute proxies for overconfidence, gambling attitude towards the investment in financial products, and bank financial advice. We define overconfident investors as those who are better than average, that is, those who believe that they know more than they actually do, this being measured by the difference, if positive, between self-reported and actual financial knowledge.⁶ We consider that investors do have a gambling

⁴ However, non-investors in securities were not all interviewed: a different questionnaire was used with 1200 non-investors only.

⁵ Unfortunately, there are no questions related to the size of the portfolio, nor the amounts invested in each type of asset.

⁶ Other proxies have been used in the literature. Goetzmann and Kumar (2008) and Bailey et al. (2008), for example, classify an investor as overconfident if her/his trading activity is in the top quartile of the distribution on investors' trading activity and if her/his performance is in the bottom quartile of the distribution

Table 2
Occasional investors versus 'heavy traders' (%).

	1 SRP	>50 SRP
1.1. Age groups ^a		
25–34	3.9	11.9
35–44	16.3	38.2
45–54	23.0	25.0
55–64	22.7	13.9
65–74	17.8	7.1
75–84	12.5	3.1
>84	3.8	0.8
1.2. Marital status		
Married ^b	72.1	57.7
Other	17.9	42.3
1.3. Area of residence		
Porto	20.3	18.3
Lisbon	24.2	41.1
Rest of the country	55.5	40.6
1.4. Professional status		
Senior management ^c	36.6	24.4
Specialists ^d	17.5	26.6
White collar ^e	21.6	34.0
Blue collar ^f	14.5	7.5
Inactive ^g	9.8	7.6
1.5. Education		
Low ^h	56.3	31.9
Intermediate ⁱ	21.2	26.0
High ^j	22.5	42.1

^a Over 25 years of age.^b With and without civil registry.^c Upper levels of public administration, directors and business managers.^d Specialists in science, physics, mathematics, engineering, health, professors, etc.^e Office workers and similar.^f Farmers, industrial workers, mechanics and non-qualified workers.^g Retired, unemployed, students.^h Four or less years of schooling.ⁱ Between five and twelve years of schooling.^j Higher education (college degree) completed.

attitude when they do not get any information regarding financial markets and products and yet they invest in financial products. Finally, we build a proxy for bank advice based on the fact that some investors go personally to the bank to talk to their account manager to get informed on financial products' matters.⁷

In the period of about fifteen years covered by the database, there were 32,843 investors who traded SRP.⁸ In the same period there were 448,746 who traded stocks. This means that for every 14 equity investors only one investor traded SRP, which is to say that the market of these financial instrument is composed of a small percentage of the Portuguese population. This may reflect the programs of privatization carried out by successive governments (which was somehow associated with the term 'popular capitalism') that led many Portuguese families to invest in the stock of firms being privatized during this period, as well as the greater complexity of SRP (in comparison with stocks) that discourages the investment in this financial instrument.

on investors' performance. We cannot follow this procedure in this paper because not all investors have invested in stocks (for which we would be able to compute performance) and we do not want to leave aside investors with trading activity in other financial assets (mutual funds, bonds, derivative products) for which we do not have complete information to compute performance on those investments.

⁷ See the Appendix for the methodology to 'construct' the overconfidence, gambling and bank advice variables.

⁸ Structured products can be defined as securities derived from (or based on) other securities, basket of securities, indices, commodities or foreign currencies. In this paper, certificates, convertible bonds and other non-plain vanilla bonds (such as structured bonds), credit linked notes, ETF and warrants are considered SRP.

3. Socio-demographic characterization of investors in structured retail products

Unlike the demographics of the general Portuguese population and of most investors, less than 25% of the investors in SRP are younger than 45 (Table 1). Furthermore, albeit mostly married, SRP investors are married in a higher proportion than other investors (but lower than the Portuguese population), and mostly live in Porto. Finally, investors in SRP have more qualified occupations than most other investors and have a higher education level than the Portuguese population since, for all age groups, the proportion of individuals who have completed higher education is higher for investors in SRP (but lower than other investors).

These socio-demographic characteristics of SRP investors lead to the conclusion that the average investor seems to have a risk profile that does not fit the financial instrument that is traded. The literature considers that the more risk-tolerant behavior is associated with younger investors who do not have family responsibilities within marriage, whereas more qualified professions are generally associated with a higher income level and permit taking higher risks.⁹ On the other hand, higher levels of education may be positively associated with greater sophistication, a necessary (but not sufficient) condition to better understand the characteristics of SRP.

Among the sample there are some investors who invested in SRP only sporadically and others who can be designated ‘heavy traders’. In fact, 52.7% have only invested in one SRP (one ISIN code) throughout the sample period, while 3.6% have invested in more than 50 different SRP (that is, more than 50 ISIN codes). These two types of investors also have different demographic characteristics. Table 2 shows that, compared to occasional investors, the heavy traders are younger, are married to a lesser extent, mostly reside in Lisbon, and are more educated. However, there is no linearity in the structure of occupations in both groups (although blue collar and inactive workers trade relatively less).

4. Multivariate analysis

4.1. Are investors in SRP different than other investors?

This section presents the results of a multivariate analysis. A *probit* model is used to distinguish the characteristics of investors in SRP among the characteristics of other investors. For this purpose only investors who have traded in financial instruments in the period January/1997 to April/2011 are selected from our database, residents abroad having been excluded. We end up with 560,005 investors in financial instruments, of which 31,022 traded at least one structured retail product during the period covered by the database.

Our base model has the following specification:

$$\text{SRP} = f(\text{Male, Age, Married, Education, Occupation, Place of Residence, Mortgage, Consumer loan})$$

where¹⁰

SRP = 1, if the investor trades in structured retail products during the period;

Male = Gender. Is equal to 1 if male;

Age = Age of investor. Defined as 2011 minus year of birth of the account holder;

Married = Marital status of the investor. Equals 1 if married;

Education = Years of education. Four categories are considered: Low = 1, if less than 4 years of education; Basic = 1, if 4 to 6 years of education; Intermediate = 1, if more than 6 but 12 or less years of education; High = 1, if a technical or higher course was completed; Occupation: Four categories are considered: Highly skilled = 1, if the investor is a business manager, director, is in the upper levels of public administration or is a specialist in science, physics, mathematics, engineering, health, professor, etc; Skilled = 1, if the investor is an office work or similar or is farmer, industrial worker, mechanic or non-qualified worker; Students = 1 if the investor is a student; Inactive = 1, if retired or unemployed; Place of Residence: Lisbon = 1 if residing in Lisbon; Porto = 1 if residing in Porto; rest of the country = 1 if residing elsewhere; Mortgage = indicator of mortgage. Equal to 1 if the investor has a mortgage; Consumer loan = indicator of loan. Equal to 1 if the investor has a consumer loan.

In fact, it has been shown that investors' behavior depends on socio-economic characteristics: age (DaSilva and Giannikos, 2004), occupation (Christiansen et al., 2008) or the environment in which they live (Goetzmann and Kumar, 2008). Calvet et al. (2009) concludes that seemingly irrational behavior diminishes substantially with investor wealth.

The probit model is estimated by maximum likelihood.¹¹ The results are shown in Table 3, column [1]. Our model includes the basic variables related to socio-demographic characteristics of investors. The results indicate that, conditioned to investors in financial instruments,¹² not-married men living in Porto who have more academic qualifications have a higher probability of being investors in structured retail products, the influence of age being non-linear. Regarding occupations, the results show that highly skilled workers (students) have in general a higher (lower) probability to become investors in SRP than inactive people, and this could be explained by the existence of retired people among the inactive population. As for the existence of consumer loans and mortgages (which certainly affect the level of wealth of investors), these controls allow us to conclude that the investment in SRP is indeed influenced by the existence of loans.

In short, investors in SRP are different than investors in other financial instruments.

The literature considers that there are some other specific characteristics that influence investor behavior. Chang et al. (2010) finds that financially literate retail investors are more rational and include less structured products in the portfolio. Campbell (2006) argues that higher educated investors are less likely to make mistakes. Thus, more educated investors would be less likely to invest in SRP if the investment in SRP is indeed rational. However, if product complexity allows alternative combinations of liquidity, risk and return, then more knowledgeable and sophisticated investors will be offered and buy more structured products.

We provide an empirical test for these predictions. Our model distinguishes those investors who may have greater knowledge of financial matters because of their education (economists) or occupation (business managers and bank staff). The variable ‘Literacy’ is a binary variable equal to 1 if the account holder is an economist, or a business manager, or a bank officer. The hypothesis that financial literacy is a determinant of investment in SRP is not rejected. Thus, we conclude that more knowledgeable and sophisticated investors are more likely to invest in SRP (model [2]). This result is consistent with a view that, compared to other products, SRP

⁹ Barber and Odean (2001) and Goetzmann and Kumar (2008) report evidence that married investors, women and older investors have less appetite for risk.

¹⁰ The database does not include any variable directly linked to the wealth or income of the investor, and we also do not know the investor's account balance, which prevents the consideration of these aspects in the analysis.

¹¹ Regarding the educational level, occupation and place of residence, the omitted categories are, respectively, less than four years of education, inactive and rest of the country.

¹² In our sample we only include investors with trading activity (i.e., with at least one trade) throughout the sample period.

Table 3
Determinants of investment in SRP – *probit* model.

	[1]	[2]	[3]	[4]	[5]
Const.	–2.077 *** –37.45	–2.099 *** –37.70	–2.177 *** –38.54	–2.181 *** –38.65	–2.248 *** –39.03
Male	0.263 *** 43.58	0.257 *** 42.49	0.275 *** 43.12	0.292 *** 39.46	0.290 *** 39.13
Age	–0.003 ** –2.36	–0.002 * –1.65	–0.002 –1.49	–0.002 –1.59	0.000 –0.22
Age squared	0.000 *** 5.88	0.000 *** 5.41	0.000 *** 5.61	0.000 *** 5.69	0.000 *** 4.54
Married	–0.043 *** –6.40	–0.047 *** –6.93	–0.049 *** –7.18	–0.068 *** –8.62	–0.067 *** –8.53
High education	0.342 *** 9.67	0.313 *** 8.83	0.351 *** 9.82	0.347 *** 9.69	0.346 *** 9.68
Intermediate educ.	0.196 *** 5.56	0.197 *** 5.57	0.232 *** 6.52	0.215 *** 6.01	0.219 *** 6.12
Basic education	0.078 ** 2.22	0.092 *** 2.61	0.095 *** 2.70	0.095 *** 2.71	0.097 *** 2.76
Highly skilled	0.195 *** 7.07	0.189 *** 6.87	0.179 *** 6.50	0.153 *** 5.46	0.158 *** 5.63
Skilled	0.003 0.11	–0.034 –1.22	–0.035 –1.27	–0.042 –1.52	–0.045 –1.62
Students	–0.083 *** –2.58	–0.070 ** –2.18	–0.073 ** –2.26	–0.074 ** –2.30	–0.079 ** –2.46
Lisbon	–0.030 *** –4.48	–0.043 *** –6.40	–0.015 ** –2.07	–0.011 –1.52	–0.029 *** –3.58
Porto	0.095 *** 13.15	0.089 *** 12.41	0.121 *** 15.16	0.122 *** 15.21	0.119 *** 14.89
Mortgage	0.180 *** 21.65	0.143 *** 17.19	0.143 *** 17.12	0.142 *** 16.99	0.142 *** 16.97
Consumer loan	0.037 *** 3.22	0.027 ** 2.33	0.027 ** 2.34	0.027 ** 2.33	0.027 ** 2.36
Literacy		0.394 *** 34.90	0.395 *** 34.91	0.392 *** 34.61	0.388 *** 34.24
Overconfidence			0.091 *** 9.29	0.087 *** 8.81	0.086 *** 8.76
Bank advice				0.045 *** 4.64	0.050 *** 5.11
Gambling					0.071 *** 5.63
No. obs with Y = 1	31022	31022	31022	31022	31022
No. observations	560005	560005	560005	560005	560005
LR stat	6814	7929	8015	8036	8067
Prob.	0.000	0.000	0.000	0.000	0.000

Obs: (i) *t*-stats in italics; (ii) *, ** and *** denote statistical significance at 10%, 5% and 1% respectively.

Note: The dependent variable is a binary variable, equal to one if the investor trades in structured retail products during the sample period. The overconfidence, bank advice and gambling variables are constructed from the survey (see the [Appendix](#)); all other variables are from the proprietary database.

likely offer value to some informed investors and allow investors to access segments otherwise not available to them.¹³

Our results are not ‘contaminated’ by overconfidence. When we control for the better than average effect (model [3]), we find that overconfident investors are more likely to invest in structured products, which is consistent with [Coval and Shumway \(2005\)](#) findings on future traders. An overconfident trader, overly wedded to prior beliefs, may discount negative public information that pushes down prices, thus holding on and taking on excessive risk.

It has also been argued that SRP are highly profitable for financial intermediaries (because they are sold to retail investors at above ‘fair or model’ price) and thus aggressive marketing of

these instruments would not be uncommon ([Kiriakopoulos and Mavralexakis, 2011](#)). Moreover, if the issuer’s profits are shared with the distributor then there are incentives for the distributor to ‘push’ the sale of SRP ([Bernard et al., 2010](#)). [Subrahmanyam \(2009\)](#) shows that distributors may delay educating inexperienced retail investors so as to earn more commissions. [Szymanowska et al. \(2009\)](#) posits that reverse convertible overpricing could be partly explained by behavioral factors such as marketing. [Vanini and Dobeli \(2010\)](#) claims that a communication style which uses behavioral finance insights in presenting a structured product is effective. Summing up, according to the existing literature, the contact between the product distributor and the investor contributes to the explanation of the popularity of SRP.

If financial intermediaries make relatively more money when they sell SRP and/or if there are incentives to ‘push’ the sale of SRP, then investors who get financial information from a bank are more likely to invest in SRP than other investors (because the bank is also a distributor of these products). We use the CMVM survey on retail investors to build a proxy for this effect (*Bank advice*). *Bank advice* is

¹³ We lack direct data on product pay-offs, thus we are not able to directly test the view that these products actually do add new assets, or merely replicate (potentially at lower transaction costs) existing assets. From our most recent knowledge of the Portuguese market it is probably both, but we are not able to disentangle them due to lack of information.

Table 4
Determinants of trading in SRP – *count* model.

	[6]	[7]	[8]	[9]	[10]
Const.	-1.591 ** -2.25	-1.617 ** -2.24	-1.926 *** -2.60	-2.031 *** -2.78	-1.851 ** -2.32
Male	1.203 *** 9.30	1.147 *** 8.68	1.226 *** 9.23	1.343 *** 8.41	1.361 *** 9.11
Age	0.004 0.21	0.008 0.39	0.012 0.56	0.012 0.58	0.006 0.28
Age squared	-0.0001 -0.78	-0.0002 -0.91	-0.0002 -1.01	-0.0002 -1.04	-0.0001 -0.77
Married	-0.314 ** -2.54	-0.285 ** -2.30	-0.298 ** -2.39	-0.426 ** -2.51	-0.427 ** -2.55
High education	1.158 *** 2.99	1.057 *** 2.59	1.103 ** 2.53	1.128 *** 2.82	1.128 *** 2.84
Intermediate educ.	0.889 ** 2.25	0.840 ** 2.05	0.877 ** 2.01	0.785 ** 1.96	0.785 ** 1.98
Basic education	0.054 0.14	0.064 0.16	-0.027 -0.06	0.024 0.06	0.021 0.06
Highly skilled	0.369 1.32	0.324 1.17	0.312 1.19	0.134 0.47	0.111 0.39
Skilled	-0.265 -0.95	-0.443 -1.59	-0.431 -1.64	-0.475 * -1.80	-0.467 * -1.78
Students	-0.769 ** -2.16	-0.749 ** -2.11	-0.766 ** -2.27	-0.779 ** -2.34	-0.759 ** -2.32
Lisbon	0.446 *** 3.81	0.409 *** 3.32	0.555 *** 4.34	0.586 *** 4.61	0.649 *** 4.07
Porto	0.201 1.52	0.207 1.57	0.355 ** 2.29	0.344 ** 2.32	0.358 ** 2.42
Mortgage	0.503 *** 3.87	0.297 ** 1.97	0.319 ** 2.06	0.326 ** 2.07	0.330 ** 2.14
Consumer loan	0.560 *** 3.37	0.557 *** 3.13	0.572 *** 3.14	0.574 *** 3.22	0.559 *** 3.15
Literacy		1.074 *** 6.62	1.063 *** 6.35	1.022 *** 6.21	1.054 *** 6.55
Overconfidence			0.359 ** 2.09	0.331 ** 1.95	0.334 ** 1.97
Bank advice				0.311 * 1.76	0.302 * 1.69
Gambling					-0.231 -1.09
LR stat	5881806	5882253	5882345	5882407	5882428
Prob.	0.000	0.000	0.000	0.000	0.000

Obs: (i) *t*-stats in italics; (ii) *, ** and *** denote statistical significance at 10%, 5% and 1% respectively.

Note: The dependent variable is the number of different SRP an investor trades during the sample period. The overconfidence, bank advice and gambling variables are constructed from the survey (see the [Appendix](#)); all other variables are from the proprietary database.

a binary variable equal to one if the investor goes personally to the bank to get information regarding financial markets and products (see details in the [Appendix](#)). We conclude that indeed *Bank advice* is a strong determinant of the investment is SRP for this variable is highly significant (model [4]).

It has also been argued that gambling may justify investors' irrationality when they opt for SRP. [Bernard et al. \(2010\)](#) attributes overpricing to the fact that retail investors may decide not to be informed about product complexity and thus choose randomly with the help of commission-based incentivized distributors. [Campbell \(2006\)](#) reports that either investors make random decisions or distributors are very successful in marketing and selling. [Nicolaus \(2010\)](#) documents a pattern of observations that is likely to be driven by speculative purposes rather than for hedging. We account for these possibilities and consider that investors who do not use any source of information at all to get informed about financial markets and instruments are gamblers and make random decisions. Our '*Gambling*' variable is the proxy we use. It is a binary variable, equal to one if the investor does not use any source to get information about financial markets and instruments (see details

in the [Appendix](#)). We conclude that these investors are more likely to have SRP in their portfolio (model [5]).

4.2. Is trading influenced by investor characteristics?

We now turn to the possibility that the above mentioned characteristics may also play a role in the number of trades in SRP an investor makes. In fact, the retail investor makes different choices. One is the investment in SRP or in other financial products (also referred to as the decision to 'participate'). Another is related to the number of trades in SRP (or 'trading frequency'). Most of the SRP products are not liquid, in the sense that either there is not a secondary market (that is, the SRP is not listed and, if traded, the OTC market is used) or the SRP is listed but trading occurs very infrequently. This means that investors in these products generally buy SRP and hold them until maturity. Thus, the number of different SRP an investor trades (regardless of the amounts invested) during the sample period is a good proxy for the number of trades, and is our proxy for trading frequency. We use this proxy as the dependent variable in a count model in which the independent variables are those from the previous section. Our negative

Table 5
Determinants of investment and trading, by type of SRP.

	CLN	CRT	ETF	CB	WAR
Panel A: Determinants of investment (<i>probit model</i>)					
Literacy	0.006 <i>0.14</i>	0.218 *** 13.34	0.351 *** 8.81	0.347 *** 24.64	0.477 *** 27.72
Overconfidence	0.063 * 1.80	0.073 *** 5.11	0.011 0.16	0.071 *** 5.79	0.044 ** 2.04
Bank advice	-0.007 -0.22	0.039 *** 2.85	0.012 0.23	0.035 *** 2.89	0.064 *** 3.25
Gambling	-0.154 *** -2.56	-0.015 -0.87	0.149 *** 2.91	0.011 0.63	0.041 ** 1.96
No. obs with Y = 1	1388	11601	538	15343	4554
No. observations	560005	560005	560005	560005	560005
LR stat	1310	4848	975	3092	3613
Prob.	0.000	0.000	0.000	0.000	0.000
Panel B: Determinants of trading (<i>count model</i>)					
Literacy	-0.111 -0.49	0.877 *** 10.58	1.588 *** 3.85	1.023 *** 7.57	0.948 *** 4.66
Overconfidence	0.003 0.02	0.152 ** 2.12	0.079 0.18	0.291 *** 4.56	0.412 1.58
Bank advice	-0.109 -0.66	-0.029 -0.38	0.796 * 1.85	0.051 0.73	0.563 ** 2.15
Gambling	-0.299 -0.97	-0.088 -0.69	0.201 0.51	-0.021 -0.39	-0.041 -0.23
LR stat	576396	475236	1647050	59104	5827721
Prob.	0.000	0.000	0.000	0.000	0.000

Obs: (i) *t*-stats in italics; (ii) *, ** and *** denote statistical significance at 10%, 5% and 1% respectively.

Note: In Panel A the dependent variable is a binary variable, equal to one if the investor trades in each type of SRP during the sample period. In Panel B the dependent variable is the number of different products of each type an investor trades during the sample period. The overconfidence, bank advice and gambling variables are constructed from the survey (see the Appendix); all other variables are from the proprietary database. Included in all the models reported in this table are the controls used in model [1] of Table 3.

binomial count model is estimated by maximum likelihood and the results are in Table 4.¹⁴

In model [6] we use the base model, with socioeconomic variables only. There we can see that male, non-married, more educated investors living in Lisbon and with loans trade more frequently than other investors, and that students trade less frequently. More importantly, more knowledgeable overconfident investors trade more, but those with a gambling attitude do not. On the other hand, the existence of bank advice increases trading frequency (at least at the 10% significance level). Thus, not only do we conclude that the socioeconomic characteristics of SRP investors and non-investors are different but also that the trading frequency depends upon those characteristics.

4.3. Are investors in SRP similar regardless of the type of SRP?

The literature considers that structured products are not all equal (see, for example Nicolaus, 2010; Kiriakopoulos and Mavralexis, 2011; Maringer et al., 2015) and that demand is strongly influenced by product characteristics that should not matter to a rational investor (Nicolaus, 2010). In this section, we test whether different investors invest and trade in different types of SRP (CLN – Credit Linked Notes; CRT – Certificates; ETF – Exchange Traded Funds; CB – Convertible Bonds; WAR – Warrants).

In Table 5 – Panel A, we present the results of the determinants of the investment in different types of SRP for the main variables of interest and conclude that the investors in credit linked notes (notes without capital protection) are different than other SRP's investors. Gambling conditions the investment in this type of SRP,

but with an unexpected negative sign. We suspect that this can be attributed to the relatively low maximum pay-offs of these notes, but we do not have information on the products pay-offs to test for this possibility. On the other hand, the *Literacy* and the *Overconfidence* variables are significant in all but one SRP type, and the *Bank advice* variable in all but two SRP types, thus confirming in general the results presented in Section 4.1.

As for the determinants of trading (Table 5 – Panel B), investors in credit linked notes are once again different than investors in other types of SRP, and the *Gambling* variable is not relevant in any regression, confirming in this case the results presented in Section 4.2.¹⁵

4.4. Robustness issues: Does complexity play a role?

Our next step is to account for the complexity of the products. For that purpose, we define a new variable (*Complex*) which is equal to one if the investor only invests in less complex assets (time deposits and treasury bonds), is equal to 2 if he invests in stocks and capital protected bonds, does not invest in SRP but may have time deposits and treasury bonds, and is equal to 3 if he has SRP, regardless of his other investments. An *ordered probit* model is now estimated with *Complex* as the dependent variable.¹⁶ Results are in Table 6 for the most relevant variables.

¹⁴ We also estimate these models with the restricted subsample that does not include occasional investors. Results are similar in all but the CRT case. In the Certificates case, the bank advice and the gambling variables become statistically significant.

¹⁶ We alternatively define *complex* as one if the investor only invests in less complex assets (time deposits and treasury bonds), is equal to 2 if he only invests in stocks and capital protected bonds (and does not invest in any other assets), and is equal to 3 if he only invests in SRP (and does not invest in any other assets). Results are essentially unchanged and are not reported.

¹⁴ Given the differences between occasional investors and other investors, and in order to test the robustness of our results, we exclude occasional investors from our sample and re-estimate our models with this restricted subsample. Results are essentially unchanged and thus not reported.

Table 6
Determinants of investment – ordered probit model.

	[11]	[12]	[13]	[14]
Literacy	0.326 *** 29.88	0.323 *** 29.89	0.312 *** 28.64	0.302 *** 27.68
Overconfidence		0.119 *** 16.61	0.101 *** 13.93	0.101 *** 13.99
Bank advice			0.195 *** 27.17	0.202 *** 28.08
Gambling				0.155 *** 16.26
No observations	322024	322024	322024	322024
LR stat	23200	23479	24215	24478
Prob.	0.000	0.000	0.000	0.000

Obs: (i) *t*-stats in italics; (ii) *, ** and *** denote statistical significance at 10%, 5% and 1% respectively.

Note: The dependent variable is *Complex*. The overconfidence, bank advice and gambling variables are constructed from the survey (see the [Appendix](#)); all other variables are from the proprietary database.

Our previous results are confirmed. In fact, financial knowledge, overconfidence, gambling and bank advice are positively associated with the investment in more complex products.

5. Conclusions

There is strong consensus that retail investors' preference for structured products is difficult to explain using the standard rational theory and that the increasing popularity of SRP can be better explained by behavioral factors. Overconfident investors are more prone to take on excessive risk for which there is no apparent reward and thus to invest and trade in SRP. Research also postulates that some retail investors view trading in the stock market as an opportunity to gamble. Moreover, it has been put forward that bank financial advice may 'push' the sale of SRP and justify the increasing popularity of these products.

The evidence we present in this paper is consistent with the view that SRP products likely offer value to some informed investors compared to other products, and that SRP allow investors to access segments otherwise not available to them. Nonetheless, our results also suggest that the increasing popularity of SRP is partially due to behavioral biases: gambling appears to be an important motivation for trading and overconfidence drives more trading in SRP. Moreover, gambling may justify investors' irrationality when they opt for some types of SRP. Our evidence on the impact of these behavioral aspects on the investment and trading of SRP is novel and helps one to understand how issuers and distributors of SRP use investors' misperception of the involved risks and lack of expertise to increase product complexity and extract consumer surplus.

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Appendix

We use the CMVM survey to construct proxies for *overconfidence*, *gambling* and *bank advice* variables. We define overconfidence based on the question: "How do you rate, on a 1 (very low) to 7 (very high) scale, your own knowledge of financial assets and markets?" (Self-evaluation). Answers to this question were compared with a financial knowledge variable measured in the 1 to 7 scale, which comes out of the survey as well. If the difference between self-reported and actual knowledge is positive

and greater than 0.9 then overconfidence = 1. We then regress this overconfidence variable on a set of socio-demographic investor characteristics. The estimated coefficients of this model are used to estimate whether investors in our main database are (are not) overconfident, using the same socio-demographic investor characteristics, and assuming that the percentage of overconfident investors is equal to the percentage of overconfident investors in the survey. Thus, *overconfidence* = 1 for the investors with the higher score in the estimated overconfident model.

Similar procedures are used to construct the *gambling* and *bank advice* variables. From the survey we define the socio-demographic characteristics of the investors who do not use any source of information to get informed on financial markets and products (investors with a gambling attitude), and those of investors who get information on financial markets and products from the bank. Assuming that the percentage of gamblers (bank informed) investors in the survey and in the main database are similar, *gambling* = 1 (*bank advice* = 1) for the investors with the higher score in the estimated gambler (bank advice) model.

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