Review of Financial Economics 18 (2009) 1–9

Contents lists available at ScienceDirect

Review of Financial Economics

journal homepage: www.elsevier.com/locate/rfe

Optimal financial education ☆

Avanidhar Subrahmanyam *

The Anderson School, University of California at Los Angeles, 110 Westwood Plaza, Los Angeles, CA 90095-1481, United States

ARTICLE INFO

Article history:
Received 14 May 2008
Accepted 20 October 2008
Available online 5 November 2008

JEL classification:
G14
G18

Keywords:
Information
Market efficiency

ABSTRACT

When agents first invest in financial markets, they are relatively inexperienced. The agents best positioned to educate the inexperienced stand to earn trading profits at the expense of inexperienced agents. Owing to this phenomenon, we show that the equilibrium amount of financial education does not fully correct the biases of the inexperienced agents. In a dynamic setting, large levels of uninformed trading volume may be generated by the inexperienced agents. This is because, in equilibrium, the experienced intermediaries may delay educating the inexperienced in order to earn commissions in earlier rounds of trade.

1. Introduction

The notion that irrational investors may be prevalent in financial markets has taken on increased impetus in recent years. For example, while early empirical studies by Black, Jensen, and Scholes (1972) and Fama and MacBeth (1973) suggest a significant positive cross-sectional relation between security betas and expected returns, supporting the capital asset pricing model (Lintner, 1965; Mossin, 1966; Sharpe, 1964), more recently, Fama and French (1992) find that the relation between return and market beta is insignificant. This calls into question the empirical importance of links between risk and expected returns.

On the importance of characteristics other than those directly related to risk-return models, the evidence is quite compelling. The landmark study by Fama and French (1992) finds that size and the book/market ratio strongly predict future returns (returns are negatively related to size and positively to book/market). Fama and French (1993) provide evidence that a three-factor model based on factors formed on the size and book-market characteristics explains average returns, and argue that the characteristics compensate for distress risk. But Daniel and Titman (1997) argue that, after controlling for size and book/market ratios, returns are not strongly related to betas calculated based on the Fama and French (1993) factors (see, however, Davis, Fama, & French, 2000 for a contrary view). More recently, Daniel and Titman (2006) argue that the book/market effect is driven by overreaction to that part of the book/market ratio not related to accounting fundamentals. The part of this ratio that is related to fundamentals does not appear to forecast returns, thus raising issues about the distress-risk explanation.

On balance, it seems reasonable to assert that the evidence on the predictability of returns from book/market ratios at least partially supports non-risk-based (i.e., behavioral) explanations. To provide rigor to the behavioral rationale, Daniel, Hirshleifer, and Subrahmanyam (2001) suggest that overconfidence induces overreaction, and that extreme book/market ratios represent overreactions to extreme private signals which are later corrected. Similarly, Barberis, Shleifer, and Vishny (1998) suggest that naïve extrapolation from past growth causes stock prices to overreact and reverse, resulting in return predictability from fundamental/price ratios. While Fama (1998) as well as Fama and French (1993) provide a contrary view to the notion that asset prices are driven by irrational traders, note that irrationals may persist in the market even if they do not affect expected returns (Hirshleifer, Subrahmanyam, & Titman, 2006). Along these lines, the work of Barber and Odean (2001a,b), Brennan (1995), and Odean (1998, 1999) suggests that individual investors are indeed overconfident, trade excessively, have mediocre investment performance, and are also susceptible to the bias of loss aversion, suggesting that such investors frequently depart from full rationality.

While in recent years, it has come to be accepted by financial economists that individual investors may indeed be overconfident or biased in other ways, what has not been studied is whether there are sufficient economic incentives on the part of other agents to induce these agents to become rational. One way in which agents may learn to be rational is to simply learn from their trading. However, Gervais and Odean (2001) point out that such activity can take a long time because agents do not update properly owing to a self-attribution bias. So the question is whether there is a role for direct financial education which may allow these agents to converge faster to the rational outcome.

☆ I am grateful to two anonymous referees, Tarun Mukherjee (the editor), Bhagwan Chowdhry, Richard Roll, Geoffrey Tate, Mark Westerfield, Liu Yang, and participants at the first UCLA/USC/UCI finance seminar for insightful and constructive comments.

* Tel.: +1 310 825 5355; fax: +1 310 206 5455.
E-mail address: subra@anderson.ucla.edu.

1058-3300/$ – see front matter © 2008 Elsevier Inc. All rights reserved.
doi:10.1016/j.rfe.2008.10.003

Trading successfully in financial markets requires a certain degree of sophistication. For example, one must learn about rudimentary aspects like the importance of risk, the potential futility from trading on already-public information, and being aware of possible behavioral biases such as overconfidence and loss aversion. Naturally, being an experienced agent in financial markets confers an advantage. Now, one aspect of financial markets is that the agents who confer financial education to the unsophisticated are themselves traders on their own account. Such agents consist, for example, of financial institutions such as investment banks, traditional commercial banks, and pension funds. While education may of course be provided by entities other than those that trade directly in financial markets (e.g., publishers of newsletters and bond ratings), the best education about financial investing is likely to be conferred by agents who already are experienced investors. What is the equilibrium level of financial education in this scenario?

To address this question, we build a model of a financial intermediary who possesses a technology that allows the correction of the biases of individual investors and/or directs them away from useless information sources. The technology is disseminated in accordance with an exogenous profit function. The profit function is assumed to be increasing in the level of bias reduction and/or in the proportion of investors educated to be rational. The intuitive notion here is that the greater the bias reduction (i.e., the more useful the advice), and the greater the proportion of individuals educated, the larger the audience reached by the educational source, the greater is the profit earned (e.g., due to the sale of advertisements in the educational material or the value created by the enhanced brand equity of the intermediary as a result of the education).[1] Within our setting, we show that the trading profits earned at the expense of inexperienced agents create a wedge between what is optimal for individual investors and what is optimal for the agents providing the education. Thus, the optimal amount of education partially, but not fully, moves the agents towards rationality. That is, agents are not fully educated about their bias or lack of sophistication.

The preceding result arises because in financial markets for someone to make abnormal expected profits, somebody has to lose money on average. Hence, if the ones profiting are experienced, they do not have the incentive to remove the inexperience of the unsophisticated. Therefore, there is an interior optimum for the level of financial sophistication in society. We also show that in a dynamic setting, the experienced intermediary may delay the education of the irrational agent till after an initial round of trading that allows the earning of commission revenues.[2] The irrational agents may survive by earning positive overall expected profits because the possibility of being educated in a later round more than makes up for losing money in the initial rounds.

Our paper recognizes the aspect that the equilibrium degree of sophistication achieved by the inexperienced depends on the trading rents earned by experienced agents at the expense of the unsophisticated. Thus, the decision to make agents sophisticated is not governed by the unsophisticated but by the experienced agents. This is contrast to the literature on information acquisition (e.g., Grossman & Stiglitz, 1980) wherein uninformed agents can choose to become informed on their own at a cost.

We find that when financial education is delivered by a monopolist, the equilibrium proportion of educated agents tends to decrease with the profit potential (i.e., the ex ante variance) of the information possessed by sophisticated agents, suggesting a policy need to reduce the informational advantage of agents with privileged access to information. On the other hand, in a competitive setting, increasing the information variance tends to increase the rents from trading and thus decrease the proportion of uneducated agents. This is because in the latter case, rents have to be competed away and any increase in rents at the expense of the uneducated simply increases the equilibrium proportion of the educated agents.

Our model also provides a scenario to explain the large levels of volume in financial markets. For example, the NYSE website indicates that the annual share turnover rate in 2003 on the NYSE was about 99%, amounting to a total volume of about 350 billion shares. Assuming a per share value of $20 and a 50 basis point round-trip cost of transacting, this amounts to a transaction cost of $17.5 billion dollars that the investing public paid in 2003. One rationale for high levels of volume is that portfolio-rebalancing or risk-sharing among investors leads to trading activity. De Bondt and Thaler (1995) argue, however, that such reasons alone would probably not result in the turnover of shares observed in reality. Indeed, Tkac (1999) shows that real-world volume exceeds that indicated by rational portfolio-rebalancing for a vast majority of traded stocks. While differences of opinion can generate volume (e.g., Buraschi & Jiltsov, 2006), the analysis of Milgrom and Stokey (1982) suggests that the volume generated by such dispersion in beliefs is likely to be small. Another rationale for volume is that irrational traders submit random trades with possibly little impact on the price, and thus create liquidity (Kyle, 1985). In this instance, it is food for thought as to why so many dollars are squandered on trading volume if it truly is a wasteful activity. Thus, the potential explanations for volume leave room for alternative rationales to be developed.

In a dynamic extension of our model, volume arises because agents learn about the validity of different sources of information through education. When an agent first decides to become a financial market investor, there potentially are scores of information sources at his disposal. These sources include email spams, internet bulletin boards, analyst recommendations, and several technical signals available on finance websites. The agent does not generally know which source is potentially useful.[3] Thus, in order to have an opportunity to trade successfully on useful information, the agent must take initial chances on potentially useless sources of information, which involve initial payments of commissions to intermediaries. Through subsequent education, the agent then is able to arrive at an assessment of what is an accurate signal;[4] this activity creates volume. We solve for an equilibrium in a dynamic market where such a phenomenon takes place.[5]

This paper is organized as follows. Section 2 analyzes the equilibrium where agents are educated not to be overconfident. Section 3 considers noise trading–i.e., an extreme case of overconfidence where agents trade on a signal that is pure noise, and a scenario where some

[1] Several financial institutions have website sections devoted to financial education. See, for example, www.citigroup.com/citigroup/financialeducation/highlights041101.htm. or www.bankofamerica.com/financialtools/. Goldman Sachs offers financial counseling programs through its subsidiary Ayco.

[2] There is an important literature on selling information in financial markets; see, e.g., Admati and Pfleiderer (1986, 1988, 1990), and Allen (1990). These papers examine whether and the extent to which information will be sold by rational informed agents to uninformed rational agents. Our focus instead is on the degree to which *irrational* agents may be educated not to trade on biases or mistaken beliefs, and thus on the equilibrium level of bias and the equilibrium proportion of educated (and thus, rational) agents in the economy. In addition, in much of this literature, the seller of does not trade on information in addition to selling it. The exception is Admati and Pfleiderer (1988) but in that paper the uninformed agents do not trade in the absence of information. In much of our paper, all agents, sophisticated or irrational, do trade in equilibrium. Further, we also consider a setting which allows for possible time-delays in education, in contrast to the static settings in the literature on information sales.

[3] The assumption here is that many retail investors are not sophisticated enough to use statistical techniques such as regression analyses and the like to discover potentially useful sources of information. See, for example, Benartzi and Thaler (2001), Lo, Repin, and Steenbarger (2005), or Hong, Stein, and Yu (2007) for evidence regarding investor naïveté about financial markets.

[4] We postulate that an agent is not able to assess the usefulness of an information source unless he trades on it.

[5] In our model the agents who learn from experience about whether their signals are valid interact with rational agents who have valid information at all times; a contrasting approach to learning is that in which a representative agent learns about the dividend process; see Guidolin and Timmermann (2007). There are other models of trading where agents interact of course; see Hommes (2006) for an excellent survey.