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Structural estimation of stock market participation costs



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ABSTRACT

This paper develops and estimates a dynamic model of stock market participation, where consumers' decisions regarding stock market participation are influenced by participation costs. The practical significance of the participation costs is considered as being a channel through which financial education programs can affect consumers' investment decisions. Using household data from the Panel Study of Income Dynamics, I estimate the magnitude of the participation cost, allowing for individual heterogeneity in it. The results show the average stock market participation cost is about 4–6% of labor income; however, it varies substantially over consumers' life. The model successfully predicts the level of the observed participation rate and the increasing pattern of stock market participation over the consumers' life cycle.

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1. Introduction

Despite the theoretical prediction that all investors will participate in stock markets if the equity premium is positive, empirical evidence shows that a substantial number of consumers do not invest in stock markets either directly or indirectly (via pension account schemes, mutual funds, or similar institutions).¹ Over the past decade, the limited stock market participation puzzle has received growing attention in both the theoretical and empirical literature. One of its prevailing explanations is the existence of stock market participation costs that arise from the time and effort necessary for obtaining and processing financial knowledge and information, for following the current trends on financial markets, for paying sign-up fees, for filing the necessary paperwork associated with stock holdings, and so on (see [Haliassos and Bertaut, 1995](#); [Vissing-Jorgensen, 2002a](#); [Gomes and Michaelides, 2003, 2005](#); [Guiso et al., 2003](#)). Stock market participation cost, however, is not observed by researchers, which constitutes a major difficulty in quantifying it. Yet using the data to reveal not only the magnitude of the participation cost but also its sources of heterogeneity are important for a number of reasons. First, participation cost is one of the parameters in some life-cycle models of portfolio allocation; therefore, its various magnitudes can lead to different implications and may result in different economic policy conclusions. Second, economic programs that aim to provide financial education to consumers may lead to reduced participation costs, thereby encouraging stock market participation. However, the effect of such programs is likely to differ for different groups of consumers. This paper develops and estimates empirically a dynamic model of stock market participation, in which

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¹ See, for example, [Haliassos and Bertaut \(1995\)](#), [Heaton and Lucas \(2000\)](#), and a collection of papers in "Household Portfolios" by [Guiso, Haliassos, and Jappelli](#), Cambridge, MA: MIT Press, 2002.

heterogeneous participation costs influence consumers' decisions regarding stock market participation. Using household data from the Panel Study of Income Dynamics, I estimate the magnitude of the stock market participation cost, allowing for individual heterogeneity in participation costs, represented by age, education, and participation experience.

Over the past century, average returns on equity have far exceeded the average returns on risk-free assets. In light of impressive equity premium over these years, the unwillingness to invest in stocks is arguably an investment mistake (Campbell, 2006; Calvet et al., 2007). The launching of financial education curricula via a number of economic policy incentives a decade ago acknowledged the importance of the promotion of consumer financial education.² Further, a growing concern in the literature and in economic policy debates reinforced the issue of limited stock market participation (see Guiso and Jappelli, 2005; Campbell, 2006; van Rooij et al., 2011). Recently, the debates resulted in a number of financial education programs designed to further increase and promote financial literacy among consumers.³ Financial education and counseling is likely to alleviate the burden on consumers' time and effort necessary for making financial decisions and to reduce the objective cost of stock market participation.⁴ In life-cycle models of portfolio allocation and wealth accumulation, participation cost may be viewed as a modeling tool that allows us to investigate whether financial education programs can influence consumers' financial choices and increase participation in financial markets.

Although stock market participation costs are not observed, the literature has collected supporting evidence that such costs are non-negligible. However, the literature finds little agreement on the size of the participation costs. Alan (2006) finds stock market entry costs equal about 2% of annual permanent income, whereas Haliassos and Michaelides (2003) obtain a wide range for entry costs, from 3% to 34% of mean annual income. The existing empirical estimates of per-period participation costs in Attanasio and Paiella (2011) and Paiella (2007) provide only a lower bound in units of nondurable consumption as low as 0.4% and 0.7% of consumption per year, arguing that the true costs of participation may exceed these levels in reality.⁵ Although these empirical findings show that even a small fee can discourage investors from stock markets, the evidence on lower bounds of participation costs gives limited information for further analysis of economic welfare. A sharper estimate of participation costs can be beneficial for evaluation of policy interventions in models of lifetime consumption and portfolio choice.

One of the contributions of the paper is that it quantifies empirically the magnitudes of the participation costs, allowing for a rich set of heterogeneity in it. The paper adapts a standard life-cycle portfolio allocation model, such as in Gomes and Michaelides (2003) and similar macro-finance studies, to the empirical framework of discrete choice dynamic programming models of individual behavior.⁶ In doing so, I shift the focus of the empirical analysis from the optimality conditions over the continuous choices (examples include consumption Euler equation and optimality condition for the share of wealth allocated to risky assets) to the optimality condition over the decision to participate in stock markets, which corresponds to the concept of the extensive margin. According to a standard portfolio allocation model, if a household decides to invest in stocks, it gives up stock market entry or participation cost. The focal point of the model environment is the consideration of the potentially forfeited participation cost, which prompts a household to make a decision to invest in stocks or not, a decision that belongs to the discrete choice. The per-period participation cost is a part of a model of stock market participation, which is estimated with the Conditional Choice Probability (CCP) estimator, developed by Hotz and Miller (1993) for estimation of dynamic discrete choice models. To my knowledge, the current study is the first to use the CCP estimator to estimate households' investment choices.^{7,8}

The estimation results provide evidence that the participation cost, measured as a share of income, can be substantial. The average stock market participation cost is estimated to be between 4% and 6% of labor income, which is well inside the range used in the literature. Next, I present strong evidence that the participation cost varies dramatically over the consumer's life. I show that the life-time variation in participation cost stems from more than the humped shape of labor income. As Alan (2012) indicates, the magnitudes of the stock market participation cost can be different for consumers in different age and education groups. Following this indication, I allow the participation costs to depend on an investor's education as a proxy for the ability to collect and process information and on age and past participation as proxies for the accumulation of information and experience. In doing so, I go one step further by exploring the dependence of participation

² Examples are the Economic Growth and Tax Relief Reconciliation Act, and Money Smart, a program launched by the Federal Deposit Insurance Corporation.

³ The latest incentive is the Dodd–Frank Wall Street Reform and Consumer Protection Act of 2010.

⁴ van Rooij et al. (2011) find that stock ownership increases sharply with financial literacy. Moreover, Bernheim et al. (2001) and Bernheim and Garrett (2003) provide evidence that consumers who were exposed to financial education in high school or in the workplace reach stronger savings outcomes. However, the literature has yet to come to a consensus regarding whether financial education programs lead to a greater financial literacy (see Hathaway and Khatiwada, 2008).

⁵ These estimates translate into a \$72 bound for Attanasio and Paiella (2011) and a \$130 bound for Paiella (2007). Vissing-Jorgensen (2002a) finds the bound of per-period fixed costs as low as \$260 can explain the behavior of most nonparticipants.

⁶ See Aguirregabiria and Mira (2010) for an excellent survey.

⁷ The method is advantageous for estimation of complex models with sizable state spaces. Implementing estimation in steps is computationally easy, and allows for monitoring the quality of estimation at each step and for flexible modification of utility specification if needed. A common challenge to the estimators of dynamic discrete choice models is the insufficiently elaborate treatment of individual unobserved heterogeneity; however, CCP estimators are capable of handling this issue due to recent developments in Aguirregabiria and Mira (2007) and Arcidiacono and Miller (2011).

⁸ Simulation-based methods are also used in estimation of the individual portfolio choice problems. Examples include Asea and Turnovsky (1998), who use the method of simulated moments to study risk-taking behavior under taxation of capital income, and Alan (2006, 2012), who uses a simulated minimum distance technique to quantify stock market participation cost and to investigate its determinants.

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