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Who holds foreign stocks and bonds? Characteristics of active investors in foreign securities

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Abstract

We study the behavior of active individual investors who hold foreign stocks and bonds directly. Using the Survey of Consumer Finances, we determine the demographic, financial, and behavioral characteristics that predict the likelihood of direct investments in foreign stocks and bonds. Our main findings are: (1) while aggregate data indicate substantial home bias, within the group of active individual investors in foreign stocks, there is no evidence of home bias, and (2) age, financial wealth, and proxies for investor confidence are positively related to direct ownership of foreign stocks and bonds, while proxies for lack of financial sophistication have a negative effect.

JEL classification: G11

Keywords: Home bias; Individual investors; Foreign investments

1. Introduction

There is a worldwide trend to shift the burden of investing to individual investors. Defined benefit plans are being replaced by defined contribution plans; in the United States, there were talks of privatizing Social Security, which have generated heated debates. An important policy question is whether or not individual investors are financially sophisticated enough for the task. This paper explores the extent to which individual investors understand the benefits of international diversification.

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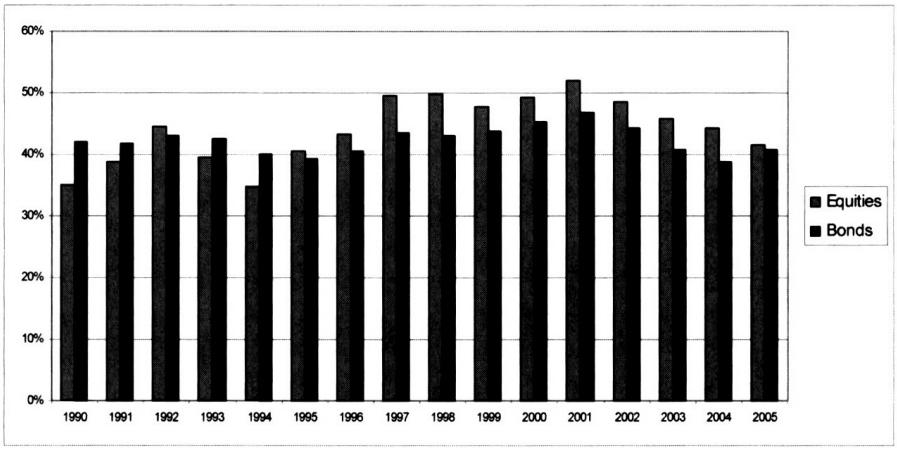

Fig. 1. Share of U.S. market capitalization in the world market. (Sources: International Federation of Stock Exchanges http://www.world-exchanges.org; Bank for International Settlements http://www.bis.org/statistics/secstats.htm.)

The benefits of international diversification have been known for some time, and discussed in numerous academic papers starting with the seminal work of Levy and Sarnat (1970). Through various innovations, investing in foreign financial assets has been made less complicated, even for individual investors. As for the desired proportions, the international version of the Capital Asset Pricing Model (ICAPM), for example, suggests that investors should invest in the global market portfolio, with the weights being proportional to each country's capitalization in the world market. In Fig. 1, we present the U.S. equity and bond market capitalizations as a percentage of their corresponding world market.

From 1990 to 2005, the share of U.S. equities in the world equity market ranged from 35% to 52%, whereas the share of U.S. bonds fluctuated from 39% to 47% of the world bond market. Hence, according to the ICAPM, a U.S. investor should hold about 50% of her equities in domestic stocks from, say, 1997 on, and on average about 45% of domestic bonds during the same period. Although the ICAPM may represent a simplified approach to international diversification, several academics and practitioners alike have arrived at comparable proportions of domestic equities (henceforth, "domestic" refers to United States) as they construct the efficient portfolio. These proportions are in the range of 50% to 70% of domestic stocks (Li et al., 2003; the Robeco Group, 1997; Miffre, 2007; Solnik, 2000).

However, in reality, individual investors never seem to hold the global market portfolio. Instead, they keep a disproportionately large share of domestic equities in their portfolios. In Fig. 2, we present the actual proportions of aggregate domestic equity and bond holdings in the United States.

If one compares Figs. 1 and 2, the actual holdings of both domestic equities and domestic bonds are far above the expected amounts. This apparent inconsistency has been dubbed the "home bias puzzle" in the financial economics literature.

One may argue, however, that not all foreign stocks are available to a domestic investor. In this case, the share of domestic equities in the global portfolio of marketable stocks would be higher than what Fig. 1 suggests, which lessens the severity of the home bias. Nonetheless, the growing market of American Depository Receipts (ADRs)[1] as well as country-

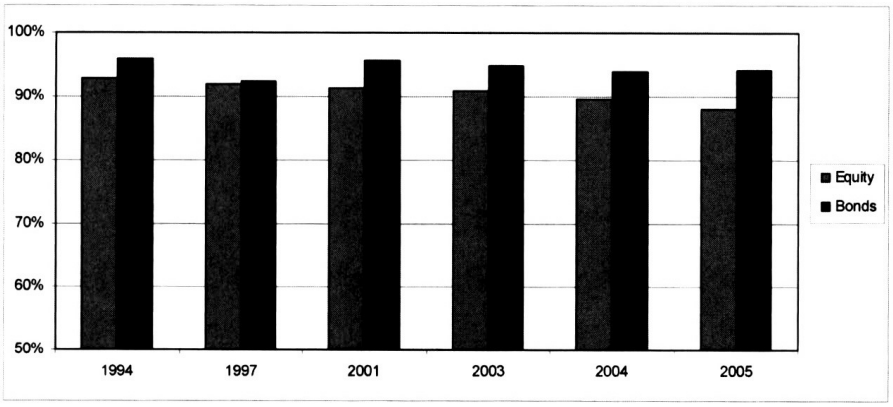

Fig. 2. Share of U.S. assets in the portfolios of U.S. investors. (Source: U.S. Department of the Treasury, Federal Reserve Bank of New York, Board of Governors of the Federal Reserve System "Report on Foreign Portfolio Holdings of U.S. Securities as of June 30, 2004" and "Report on U.S. Portfolio Holdings of Foreign Securities as of December 31, 2003," www.treas.gov.)

specific exchange traded funds (ETFs) provides investors with an additional opportunity to diversify internationally without having to incur higher transaction and information costs.[2] This trend no doubt alleviates part of the foreign stock marketability problem.

The vast majority of extant studies, which are cited in the next section, examine home bias at the aggregate level using average investor or country characteristics. It is difficult, however, to develop a more complete picture of foreign asset holdings without studying the behavior of individual investors. For example, aggregate data do not provide answers as to how widespread the home bias phenomenon is, and which types of investors are more prone to avoiding foreign assets in their portfolios.

In this paper, we use the U.S. Surveys of Consumer Finances (SCF) to conduct an empirical analysis to shed light on the following issues. Which individual investors are more likely to hold direct investments in foreign stocks and bonds? What are the distinguishing characteristics of those who hold them? How much do they hold? Can we partially explain the home bias phenomenon at the individual investor level, using demographical, financial, behavioral, and other micro characteristics? We believe that the answers to these questions have important implications for financial advisors and policy makers alike.

The SCF conducted by the Federal Reserve Board provides a wide range of household financial information, including directly held foreign stocks and bonds. (Note that "foreign" in the SCF refers to assets issued by companies whose headquarters are located outside the U.S.[3] Hence, ADRs, ETFs, and cross-listed stocks are considered foreign stocks.)

Because only directly held foreign securities are identified in the SCF, we are effectively focusing on the behavior of active investors, as opposed to passive investors who do not make bets on individual securities. Active investors are interesting and their portfolios may provide useful insights because these investors tend to be more confident and/or sophisticated, or at least perceive themselves to be so. Apart from conducting a microanalysis of direct foreign asset holdings, another distinguishing feature of our study is that we consider both foreign stocks and foreign bonds. To the best of our knowledge, we are the first to study individuals' investment in foreign bonds.

Omitting foreign asset holdings in pension accounts (because of data limitations) is a potential caveat to our study. However, according to the Investment Company Institute (2004), the proportion of foreign equities held in popular retirement vehicles, such as IRA or 401(k), varies between 8% and 11%. These numbers, as we will show, are not sufficient to over compensate the home bias in non-pension accounts. On the other hand, focusing on directly held stocks and bonds with unrestricted choice of investments has an advantage over defined-contribution pension plans, where the menu of investment choices is fixed and often quite limited.[4] As pointed by Benartzi and Thaler (2001), individual investors may be influenced by the choices presented to them. Hence, a true home bias is more likely to manifest itself in other types of investment accounts, where there is a completely free and unlimited choice of assets.

Another potential caveat is that individuals may hold stocks directly for control purposes, which may substantially reduce or even eliminate home bias as argued in Dahlquist et al. (2003). This effect, however, seems to be less significant in the United States than in many other countries as the same study reports that closely held stocks represent only eight percentage of U.S. equities. Accounting for closely held shares, the authors estimate that the recommended share of domestic stocks for U.S. investors increases from 50% to 63%, which reduces home bias but does not eliminate it.

To preview our findings, whereas aggregate data indicate that there is a substantial home bias in the United States, within the group of active individual foreign stockholders, however, the average ratio of foreign to total stocks does lie within the recommended range of 30% to 50%. Hence, if we were to include other forms of foreign asset holdings, for example, through pension accounts and mutual funds, we can safely conclude that home bias is not a phenomenon across the board. This type of heterogeneity is masked by only looking at aggregate data. Further, we establish the links between an individual investor's financial, demographic, and behavioral characteristics, and the extent of home bias. In particular, using various proxies, we provide evidence supporting the hypotheses that investors' lack of financial sophistication and lack of awareness of diversification benefits are two factors that contribute to the bias against foreign securities. Lastly, we find a weak linkage between expectations about the domestic economy and foreign asset holdings.

The rest of the paper is organized as follows. In Section 2, we review existing literature. In Section 3, we describe the dataset and the estimation method we employ. In Section 4, we report and discuss the distributions of foreign stocks and bonds ownership. In Section 5, we provide the definition of explanatory variables. Empirical results are presented in Section 6, followed by a conclusion in Section 7.

2. Literature review

A number of reasons have been put forth to explain the equity home bias. For example, stock market expectations at home versus abroad (French and Poterba, 1991; Bohn and Tesar, 1996; Kilka and Weber, 2000); transaction costs (Tesar and Werner, 1995); hedging nontradable assets (Baxter and Jermann, 1997) or purchasing power risks (Cooper and Kaplanis, 1994); familiarity with the home market (Kang and Stulz, 1997); informational

advantage of domestic investors (Choe et al., 2005; Hau, 2001; Grinblatt and Keloharju, 2000; Dvorak, 2005); geographical distance, language, and stock market development (Chan et al., 2005); investor's perceived confidence in her ability (Graham et al., 2006); and ambiguity of foreign market returns (Uppal and Wang, 2003), among others. The equity home bias literature is voluminous and still growing. Interested readers should refer to Lewis (1999) and Karolyi and Stulz (2003) for an extensive review.

Home bias in bond portfolios has, in general, received much less attention. Nevertheless, it is not any less relevant than the equity home bias. Studies have shown that the gains from international diversification in bond portfolios could be significant (Levy and Lerman, 1988; Jorion, 1991), despite exchange rate risk (Levich and Thomas, 1993), and increased correlations in bond markets around the world (Hunter and Simon, 2004).

Very few studies look at the home bias puzzle through the prism of an individual's investment decisions. Karlsson and Norden (2007) employ survey data of Swedish households, and estimate the likelihood of home bias within their defined-contribution (DC) pension accounts; Bailey et al. (2008) identify investor characteristics that are associated with home bias using panel data from a large U.S. discount brokerage firm for the period 1991 to 1996.

Using the SCF allows us to provide a different perspective from Karlsson and Norden (2007) and Bailey et al., (2008). First, our investor database is representative of the U.S. population, not just those holding an account with a particular discount brokerage firm. Second, our data are fairly up to date, and they include the bull run leading up the burst of the technology bubble as well as the subsequent adjustment period. New financial innovations such as ETFs, and a growing number of ADRs and cross-listed stocks were introduced during this period. Third, the SCF provides useful information on the investors' individual characteristics, such as their educational level, expectations about the economy, and so forth Finally, the SCF contains information on foreign bond holdings.

3. Data and estimation method

The SCF, sponsored by the Federal Reserve Board, is a comprehensive triennial survey of U.S. household income, assets and liabilities, and demographic characteristics. We employ data from the five most recent surveys that contain information on direct foreign asset ownership: 1992, 1995, 1998, 2001, and 2004. The number of households interviewed in each survey is 3906, 4299, 4309, 4449, and 4519, respectively.

The public data set of each survey consists of five implicates, as a result of the multiple imputation technique used to handle missing data. Some data may be missing because respondents are unable or unwilling to provide certain pieces of information.[5] We utilize information contained in all five implicates. Using the Repeated-Imputation Inference (RII) technique described in Montalto and Sung (1996), we include both the within-imputation variance and the across-imputation variance in generating inferences. (Ignoring this extra variance will overestimate the statistical significance of the results.) The RII estimation technique analyzes each implicate separately using standard methods, and combine the results to produce estimates and confidence intervals that incorporate missing-data uncer-

tainty. As RII method cannot be used in some of the models (multinomial logit), we applied an alternative method, which we describe in Section 5.2.

4. Distributions of direct foreign stock and bond ownership

We look first at the distributions of foreign stock ownership among U.S. households that have direct stock holdings. A foreign stock in the SCF is defined as a stock "in a company headquartered outside of the U.S." Hence, cross-listed stocks, ADRs, and foreign ETFs listed on American exchanges, are considered "foreign."

The share of foreign stockholders as percentage of all investors with directly held stock gradually rises from 8% in 1992 to 11.5% in 2001, and then drops slightly to 10.7% in 2004. The average portion of foreign equity in directly held stocks varies between 3.1% and 4.0% (Panel A). From a separate calculation, we find that a mere 0.8% of households who hold stocks directly have the ratio of foreign to total stocks within the recommended range of 30% to 50%. Thus, there is a very substantial home bias for the vast majority of U.S. households, even if one includes holdings in mutual fund and retirement accounts, as we discussed in the introduction. However, within the group of foreign stockholders, the average ratio of foreign to total directly held stocks does lie within the recommended range of 30% to 50% (Panel B). Interestingly though, this relatively high average is the result of the spike in the distribution at 100%.

We hypothesize that sophisticated investors who are aware of the benefits of diversification and have information advantage over unsophisticated ones, have less home bias in their portfolios. Grinblatt and Keloharju (2001) and Karlsson and Norden (2007) report that this is the case with Finnish and Swedish investors. Therefore, we focus next on a particular group of households, which we will call "sophisticated investors."[6] This group consists of investors who possess two characteristics: education level of college or higher and number of different stocks held between 20 and 50.[7] We consider the first characteristics to be a proxy for overall sophistication and the second one—for awareness of diversification benefits. In Panel C of Table 1, we report the distribution of foreign stock ownership among this subsample of investors.

A comparison of Panels A and C reveals that sophisticated investors are more likely to hold foreign equities than investors from the full sample of stockholders. In the full sample, more than 88% of stockholders hold no foreign equities across the five years, while this number ranges from 64% to 69% in the sophisticated group (these differences are statistically significant at 1% level). However, it is interesting to note that the average percentage of foreign to total equities is not necessarily higher in the sophisticated group. The distribution of foreign stock ownership for the sophisticated group has a declining pattern, with a vast majority (from 80% to 98%) holding below 20% of their stocks in foreign equities. Thus, even sophisticated investors tend to hold smaller proportions of foreign assets in their portfolios than the recommended range.

To provide an alternative view, we use a different definition of financial sophistication. Under the second definition, we call sophisticated those investors who possess education level of college or higher, and who hold five or more mutual funds. The reason is that an

Table 1 Distributions of foreign stock ownership

Foreign stock/directly held equities	1992	1995	1998	2001	2004
Panel A: All stock holders					
0%	91.7	91.5	88.0	88.6	89.3
0–20%	3.4	3.5	7.0	7.4	6.5
20–40%	1.4	0.9	2.0	0.4	1.8
40–60%	0.5	0.6	0.5	0.3	0.5
60–80%	0.1	0.7	0.7	0.5	0.5
80–100%	0.2	0.2	0.4	0.4	0.3
100%	2.8	2.5	1.4	2.4	1.2
Average percentage	4.0	4.0	3.7	3.9	3.1
N of obs.	1141	1189	1342	1465	1433
Panel B: All foreign stock holders					
0%	0.0	0.0	0.0	0.0	0.0
0–20%	42.9	41.6	58.6	65.2	60.5
20–40%	17.0	10.7	16.5	3.7	16.3
40–60%	5.6	7.5	4.4	3.0	4.8
60–80%	1.7	8.5	5.5	4.3	4.5
80–100%	3.1	2.5	3.6	3.6	2.4
100%	29.7	29.2	11.5	20.3	11.5
Average percentage	48.3	46.9	30.5	34.0	28.6
N of obs.	212	227	257	281	261
Panel C: Educated stock holders who hold 20–50 stocks					
0%	64.2	68.9	68.3	64.7	68.9
0–20%	20.6	27.6	23.5	33.5	28.4
20–40%	10.1	0.5	6.1	1.0	1.0
40–60%	3.7	1.9	0.4	0.0	0.6
60–80%	1.4	0.9	0.6	0.3	0.9
80–100%	0.0	0.2	0.2	0.4	0.3
100%	0.0	0.0	0.9	0.1	0.0
Average percentage	7.6	3.1	4.9	2.7	3.4
N of obs.	173	173	252	317	286
p-value for differences with Panel A[a]	0.00	0.00	0.00	0.00	0.00
Panel D: Educated stock holders who hold 5 or more mutual funds					
0%	84.2	85.7	80.2	76.6	80.2
0–20%	8.2	9.5	13.6	19.0	15.0
20–40%	4.1	1.4	1.8	0.6	1.9
40–60%	2.2	1.2	0.9	0.3	0.8
60–80%	0.0	1.2	1.1	1.6	0.9
80–100%	0.0	0.1	0.4	0.9	0.4
100%	1.4	0.9	2.1	1.0	0.9
Average percentage	4.4	3.5	5.4	4.7	3.9
N of obs.	107	197	296	345	320
p-value for differences with Panel A[a]	0.04	0.03	0.00	0.00	0.00

Percentages in Table 1 and Table 2 calculated using weights provided by the SCF. The number of observations, on the contrary, is not weighted. As SCF oversamples wealthy households, the unweighted number of foreign securities holders is higher than the weighted number.

[a] For stockholders who no not own foreign equities.

investor may choose to diversify through mutual funds. The distribution of foreign stock ownership for this subsample of investors is reported in Panel D of Table 1. One can see that

this group has much higher incidence of not holding any foreign stocks compared to the sophisticated investors in Panel C (the differences are statistically significant at 5%), although they are still more likely to hold foreign stocks than investors from the whole sample.

In Table 2 below, we show the distribution of foreign bond ownership: Panel A shows the distribution among all surveyed households that hold bonds, Panel B displays the distribution among foreign bondholders only, whereas Panel C presents the distribution among sophisticated bondholders.

It is worth noting that practically all foreign bond holders fall under our definition of sophisticated investors. Judging from foreign bond ownership distributions, the fact of home bias in directly held bonds is even more evident than in stocks. Only from 3.5% to 6% of bondholders own foreign bonds. The pattern of foreign bond ownership seems to be less clear that the one of foreign stocks. This is not surprising as the sample of foreign bondholders is small and is in the range of 26 to 53, depending on the year of survey. As can be seen in the Panels C and D, sophisticated bondholders are a little more likely to hold foreign bonds than all bondholders are, although most of the differences are not statistically significant.

Overall, the distributions presented above provide some support for our hypothesis that home bias manifests itself much less in the portfolios of "sophisticated" investors than in those held by "unsophisticated" investors. In Section 6, we confirm in multivariable setting that investor financial sophistication and awareness of diversification benefits partially explain the likelihood and the magnitude of home bias.

5. Definition of explanatory variables

5.1. Proxies for financial sophistication

Education: Graham et al. (2006) find that higher level of education and income leads to higher perceived competence, which may induce the investor to feel more confident about investing in foreign securities. Education can also be correlated with financial sophistication. Both higher competence and financial sophistication are expected to increase the likelihood of holding foreign assets.

We use two dummy variables for education:[8] COLLEGE (it is equal to one if the respondent has at least one year of undergraduate education, and zero otherwise), and GRAD (it is equal to one if the respondent has graduate education, and zero otherwise).

Ownership of margin accounts: Dummy variable OWNMGAC equals 1 if the household has a margin account at a stock brokerage. The hypothesis is that investors who own a margin account are more experienced, and are expected to execute more "complicated" trading strategies.[9]

Working in the financial industry: We use a dummy variable FINANCE, which equals one if the occupation of the head of the household belongs to Category 5 in the SCF. This category represents financial, insurance, and real estate services. Presumably, investors whose occupation falls within this category are more financially knowledgeable than others

Table 2 Distributions of foreign bond ownership

Foreign bonds/Directly held bonds	1992	1995	1998	2001	2004
Panel A: All bond holders					
0%	95.3	94.5	96.7	94.1	95.5
0–20%	2.6	2.2	2.3	1.1	1.2
20–40%	0.6	1.0	0.5	1.2	0.3
40–60%	0.7	0.2	0.0	0.4	0.2
60–80%	0.2	0.2	0.0	0.2	0.2
80–100%	0.1	0.4	0.0	0.2	0.1
100%	0.5	1.5	0.6	3.0	2.5
Average percentage	1.5	2.6	0.8	3.8	3.0
N of obs.	545	458	416	412	390
Panel B: All foreign bond holders					
0%	0.0	0.0	0.0	0.0	0.0
0–20%	56.1	39.7	69.3	17.7	25.8
20–40%	12.1	19.0	14.1	19.8	7.5
40–60%	15.1	3.9	0.0	7.0	3.7
60–80%	4.1	3.1	0.0	3.0	3.7
80–100%	1.4	7.0	0.0	2.8	2.3
100%	11.3	27.4	16.6	49.7	57.0
Average percentage	32.0	46.8	24.9	64.5	67.4
N of obs.	53	41	26	26	32
Panel C: Educated bondholders who hold 20–50 stocks					
0%	82.4	94.8	85.7	94.6	93.5
0–20%	8.2	2.5	12.1	3.3	1.9
20–40%	4.3	1.7	1.5	0.7	1.2
40–60%	4.0	1.0	0.0	1.4	0.0
60–80%	0.0	0.0	0.0	0.0	0.4
80–100%	1.1	0.0	0.0	0.0	0.5
100%	0.0	0.0	0.7	0.0	2.6
Average percentage	4.8	1.4	1.7	1.2	3.4
N of obs.	131	99	124	137	136
p-value for differences with Panel A[a]	0.00	0.91	0.00	0.80	0.39
Panel D: Educated bondholders who hold 5 or more mutual funds					
0%	90.3	88.2	90.9	91.8	96.4
0–20%	5.7	2.5	5.5	1.1	0.7
20–40%	2.4	1.8	0.8	3.8	0.0
40–60%	0.9	0.9	0.0	1.3	0.0
60–80%	0.0	0.2	0.0	0.6	0.4
80–100%	0.6	0.0	0.0	0.5	0.0
100%	0.0	6.4	2.8	1.0	2.6
Average percentage	2.0	7.6	3.5	3.5	2.9
N of obs.	63	98	111	130	89
p-value for differences with Panel A[a]	0.20	0.07	0.05	0.40	0.71

[a] For bondholders who no not own foreign bonds.

are. This measure, however, is imperfect as it includes real estate services, which is, strictly speaking, outside the financial industry.

Optimal level of diversification: In the previous section, we employed two proxies for the awareness of diversification. They led to similar conclusions, but the individual stock holdings proxy yielded stronger results as well as a larger sample. Following this proxy, we

code the dummy variable, DIV, as one if an investor holds between 20 and 50 different stocks, and zero otherwise. Investors that hold the number of stocks within the specified range are assumed to be more aware of diversification benefits than others.

We expect all the above variables to have positive coefficients as they should increase the likelihood of holding foreign assets.

Company stock: An investor who holds a relatively high proportion of company stock (CS) may be too comfortable with the familiar, and/or less aware of the benefits of diversification.[10] We expect this investor to be less likely to own foreign stocks. By construction, however, this variable is only applicable to those stockholders.

5.2. *Control variables*

Based on previous research in the home bias literature, we decided to include the following control variables in the multivariable analysis.

Age: The variable AGE is the age of the head of household in the SCF. Other studies find that age is significant in explaining the holdings of foreign assets; they, however, do not agree on the direction of age effect. While Graham et al. (2006) and Karlsson and Norden (2007) report that older investors are less likely to hold foreign assets, Bailey et al. (2008) findings are the opposite.

Gender: We use MALE dummy variable to control for gender; MALE equals one if the head of the household is male and zero otherwise.

Labor income: The variable LAB equals the respondent's income from wages, salaries, professional practice, business, or farm, as a fraction of their total income. According to Graham et al. (2006), "a person with higher income may feel more successful and more powerful in daily life. This feeling can carry over to the domain of financial decision-making." They find an empirical confirmation of the positive relationship between income and competence. Thus, higher income leads to higher competence, which, in turn leads to a higher share of foreign assets in investor's portfolio. Another reason why labor income matters is provided by Baxter and Jermann (1997). As labor income has a higher correlation with domestic stock market returns than with foreign returns, higher labor income should induce most investors to hold more foreign equities. Finally, as reported by Bhandari and Deaves (2006), both income and education are positively related to overconfidence, which may affect foreign assets holdings (see the discussion of the number of trades variable below). Therefore, based on the aforementioned reasons, we can expect the income coefficient to be positive.

Wealth: Although it is correlated with income, wealth may have a different channel of influence. According to Vissing-Jorgensen (2003), wealth can reduce the impact of information/transaction costs of participating in a certain segment of the market for risky assets. She argues that wealth may reduce the magnitude of behavioral biases, including home bias. The variable FNNW equals the household's financial net worth, which is the difference between the value of financial assets and financial liabilities.

Degree of risk-aversion: Respondents in the SCF are asked to choose among four hypothetical investment scenarios.[11] Their answers are indicative of their level of risk aversion, from 1 (least risk averse) to 4 (most risk averse). The scenarios are formulated in

a mean-variance framework. Therefore, because holding foreign assets should make a portfolio less risky, it is logical to suggest that a more risk-averse investor would hold a higher percentage of foreign stocks and/or bonds in her risky portfolio. However, when the likelihood of holding foreign risky assets among all households is considered, the more risk-averse may be less likely to hold foreign assets because they are less likely to hold any risky assets. Further, investors that are more risk-averse may be more reluctant to hold foreign assets because the latter are less familiar than domestic assets. Hence, a negative relationship between foreign asset ownership and risk aversion is entirely possible, even if it might be counterintuitive at first glance. We employ three dummy variables, R2 through R4, to represent the respondent's level of risk aversion, corresponding to answers 2 through 4 in the survey.[12]

Frequency of trades: We consider the frequency of trades in the respondent's brokerage account (variable NTRADE) as a proxy of overconfidence based on several studies. Odean (1998) develops a theoretical model that demonstrates that overconfident investors trade excessively; Deaves, Lueders and Luo (2004) as well as Dorn and Huberman (2005) confirm this empirically. We expect NTRADE to have a positive coefficient, based on the following intuition. First, investors that are more overconfident may have less ambiguity aversion. Second, they may overestimate their knowledge about foreign assets. Both reasons would make overconfident investors to be less averse to foreign assets. Bailey et al. (2008) find that more overconfident investors exhibit less home bias in their investment portfolios.

Optimism/pessimism about the prospects for the U.S. economy: As argued by French and Poterba (1991), Bohn and Tesar (1996) and Kilka and Weber (2000), higher expected returns in a particular market explain investors' bias towards that market. To test this hypothesis, we use a proxy for investors' expectation about U.S. market returns, namely, their optimism or pessimism about the prospects for the U.S. economy. The question in the SCF asks: "Over the next five years, do you expect the U.S. economy as a whole to perform better, worse, or about the same as it has over the past five years?" The dummy variable, OPT, indicates the answer "better," whereas PES equals the response "worse."

Expectations about future interest rates: Similarly, investors' expectations about domestic future interest rates could influence their decision to invest in foreign securities, especially bonds. To test this hypothesis, we use respondents' answers to the question: "Five years from now, do you think interest rates will be higher, lower, or about the same as today?" We use two dummy variables, HIINT and LOWINT, which indicate the answers "higher" and "lower," respectively.

6. Empirical analysis

6.1. Probit models

We start the multivariable analysis with a probit model that seeks to explain the likelihood of owning foreign stocks, foreign bonds, and foreign assets (stocks and bonds). Our dependent dummy variables are the ownership of foreign stocks, the ownership of foreign bonds, and the ownership of foreign assets, respectively. The dependent variables take on the

value one if an investor owns at least \$100 worth[13] of a particular class of foreign assets and zero otherwise. To achieve a desirable sample size, we pool data from all five SCF surveys: 92, 95, 98, 01, and 04. The regressions are run on the subsamples of active investors, that is, those who own stocks and bonds directly to isolate the determinants of ownership of foreign assets from the determinants of ownership of *any* stocks and bonds, including domestic ones.

Our first probit model aims to explain the likelihood of foreign stock ownership with the independent variables identified and discussed in the previous section. Included also are four time dummy variables, y95 for the 1995 SCF, y98 for the 1998 SCF, y01 for the 2001 SCF, and y04 for the 2004 SCF. Hence, is the base year is 1992. The results are presented in Table 3.

All of our proxies for investor's financial sophistication and awareness of diversification benefits have the expected signs although not all of them are statistically significant. The parameter estimates for both education dummies, COLLEGE and GRAD, are positive, as expected, and statistically significant at 5%. This result can be interpreted as a support for the hypothesis that higher level of education reduces home bias through one or both channels: leading to higher competence or greater financial sophistication. Our measures for awareness of diversification benefits, DIV and CS, also have positive and statistically significant coefficients. Other proxies for financial sophistication, such as FINANCE and OWNGMAC, have positive parameter estimates, although they are statistically insignificant. The insignificance of the FINANCE coefficient may be because of the fact that in the public dataset of the SCF, the financial services occupational group is lumped together with real estate and other business services.

The results above provide some support for our hypothesis that a reason behind home bias is an investor's lack of knowledge about the benefits of international diversification. There are also some interesting results from the control variables.

LAB, labor income as a fraction of total income, has a statistically insignificant parameter estimate. Thus, we can neither confirm nor reject the two hypotheses stated before, namely that competence and correlation of labor income and domestic market stock returns should negatively affect home bias. AGE has positive coefficient, which is also statistically significant. This result is in line with Bailey et al. (2008) but is the opposite to the findings of Graham et al. (2006) and Karlsson and Norden (2007). FNNW, which represents financial net worth, also has a positive and statistically significant coefficient, which is expected and is in line with the results of other studies.

The positive and statistically significant parameter estimate of NTRADE could mean that more overconfident investors (in this case those who trade on their brokerage accounts more frequently) are more likely to hold foreign equities.

Investors' self-reported degree of risk-aversion at the levels of 3 ("take average financial risks expecting to earn average returns"), and 4 ("not willing to take any financial risk") is negatively associated with the likelihood of owning foreign stock. As was mentioned in Section 4, two effects may play a dominant role here. First, the more risk-averse investors are less likely to hold any stocks; second, it could be that uninformed investors consider foreign stocks to be riskier either because of the lack of information about them or because these stocks are simply less familiar. Yet, another possible reason may be the perception of high exchange rate risk associated with holding a foreign stock.

Table 3 Probit models: Ownership of foreign stocks and bonds

	Ownership of foreign stocks		Ownership of foreign bonds		Ownership of foreign stocks or bonds	
	Estimate	*p*-value	Estimate	*p*-value	Estimate	*p*-value
INTERCEPT	−1.3789**	0.0000	−1.7268**	0.0000	−1.6833**	0.0000
AGE	0.0054**	0.0003	0.0020	0.5432	0.0079**	0.0000
MALE	0.0055	0.9382	−0.0028	0.9874	−0.0173	0.7969
LAB	−0.0096	0.4131	−0.0282	0.5565	−0.0099	0.3948
FNNW	0.0047**	0.0000	0.0019**	0.0389	0.0050**	0.0000
COLLEGE	0.1908**	0.0148	0.5380**	0.0313	0.2812**	0.0001
GRAD	0.2454**	0.0027	0.6712**	0.0072	0.3917**	0.0000
R2	0.0002	0.9977	−0.3798**	0.0140	−0.0058	0.9342
R3	−0.2002**	0.0056	−0.2960*	0.0507	−0.1759**	0.0122
R4	−0.3698**	0.0003	−0.4413**	0.0392	−0.3934**	0.0000
FINANCE	0.0521	0.2388	0.0480	0.6037	0.0402	0.3429
DIV	0.5466**	0.0000	0.0123	0.9034	0.6148**	0.0000
CS	−1.0121**	0.0000				
OWNMGAC	0.0825	0.2960	−0.3013	0.1526	0.0707	0.3515
NTRADE	0.0033**	0.0000	0.0020**	0.0102	0.0036**	0.0000
OPTIM	0.0071	0.8831	0.1328	0.1677	0.0266	0.5571
PES	0.0746	0.1565	0.0435	0.6981	0.0819*	0.0991
HIGH INT	0.0054	0.9142	−0.0466	0.6429	0.0027	0.9544
LOW INT	0.1226	0.2397	−0.1092	0.5820	0.0693	0.4645
Y95	0.0052	0.9379	−0.0499	0.6965	0.0016	0.9796
Y98	−0.0693	0.2853	−0.2708**	0.0468	−0.1102*	0.0714
Y01	−0.1692**	0.0084	−0.3219**	0.0199	−0.2049**	0.0012
Y04	−0.0748	0.2368	−0.2140	0.1302	−0.1273**	0.0368
No. of obs.	6668		2232		7054	
Log likelihood	−2779		−602		−3058	
Pseudo R2	0.12		0.04		0.10	

** Significance at 5%. * Significance at 10%.

Notes. Pooled data from the Survey of Consumer Finances, 1992 through 2004 dependent variable is a dummy, which equals one if an investor owns directly held foreign stocks (bonds, stocks, or bonds) and zero otherwise. Repeated Imputation Inference (RII) (see Montalto and Sung, 1996) was employed in the estimation. The explanatory variables are: AGE - age of the head of household; MALE - indicates whether head of the household is male. LAB - labor income as a fraction of total income; FNNW - financial net worth; COLLEGE - indicates at least one year of undergraduate education; GRAD indicates at least one year of graduate education; R2-R4 - degree of risk-aversion (from low to high); FINANCE - working in the finance industry; DIV - indicates whether the number of directly held stocks falls into the optimal range (20–50); CS - share of the company stock in directly held equities; OWNMGAC - ownership of margin accounts; NTRADE frequency of trades in a brokerage account; OPT (PES) - optimistic (pessimistic) about the prospects for the U.S. economy; HIGH INT (LOW INT) - expect higher (lower) interest rates in five years from the time of survey.

In the second probit model, we attempt to explain the likelihood of foreign bond holdings. This model is based on the subsample of bondholders to isolate the determinants of foreign bond holdings from the determinants of holding any bonds. Therefore, we have to drop CS variable from the regression as it applies only to stockholders. Of our main explanatory variables, GRAD and COLLEGE both have positive coefficients, and they are significant at five percent. The parameter estimate of DIV is not statistically significant, which is not surprising as this variable is less applicable to bondholders than to stockholders.

Variables FNNW and NTRADE that successfully explained foreign stock ownership are also statistically significant in explaining the likelihood of foreign bond ownership. Finally, bondholders with risk aversion level higher than one have lower probability of holding foreign bonds.

Interestingly, investors' expectations about domestic interest rates (variables HIGH INT and LOW INT) and domestic economy do not seem to matter in their decisions to own foreign bonds.

The third probit model presented in Table 3 concerns the likelihood of holding any foreign assets, stocks or bonds.

The results of this model are qualitatively very close to those of model for foreign stock ownership, described above in detail. The main difference is that now variable PES (having pessimistic expectations about the future of the U.S. economy) is positive and statistically significant, although at 10% level. This provides some support for the expectations hypothesis: investors may simply chase higher returns when they invest abroad.

6.2. Multinomial logit models

For robustness check, we also estimate the probability of owning foreign stocks, bonds, and assets employing multinomial logit models, which allow us to separate the determinants of holding domestic assets only from holding foreign assets. The dependent variables in these models have three modes: 0 – not holding any stocks (bonds, assets) directly; 1 – holding domestic stocks (bonds, assets) only; 2 – holding foreign stocks (bonds, assets). Therefore, instead of one set of coefficient values, multinomial logit programs report two (1 and 2), the omitted category being 0. However, as the RII technique is not applicable to multinomial logit models with multiple coefficient modes, we have to use an alternative method to estimate statistical significance of models' results. Following Hogarth, Anguelov and Lee (2004), we run all models for all five implicates and take the average of five coefficients. A coefficient is considered statistically significant if it is significant for at least four implicates.

The results of multinomial logit models are presented in Table 4.

As the focus of this paper is ownership of foreign stocks and bonds, we are mostly interested in the second set of coefficient values (those with Function # equal to 2). The results of the first model, which measures the likelihood of holding foreign stocks, are very similar to the corresponding probit model. Again, investors with college or graduate education, holding sufficiently diversified stocks portfolios and smaller share of CS, as well as older, wealthier, less risk-averse and those who trade more frequently in their brokerage accounts, are more likely to hold foreign stocks. Moreover, those who have pessimistic expectations about the performance of the domestic economy are more likely to hold foreign stocks (although the corresponding variable PES is significant only at 10% level).

In the second model, with probability of foreign bonds ownership as the dependent variable, significant variables are the same as in probit model for foreign bonds, however, the significance level of FNNW, COLLEGE, and R4 changes from 5% to 10%. Finally, the third model, measuring the probability of ownership of foreign stocks or bonds, has qualitatively the same results as the first model (foreign stocks) and the corresponding probit model.

Table 4 Multinomial logit models: Ownership of foreign stocks and bonds

Parameter	Function #	Ownership of foreign stocks		Ownership of foreign bonds		Ownership of foreign stocks or bonds	
		Estimate	$p > \chi^2$	Estimate	$p > \chi^2$	Estimate	$p > \chi^2$
INTERCEPT	1	−2.3013**	<.0001	8.7613**	<.0001	−1.9824**	<.0001
INTERCEPT	2	2.3999**	<.0001	3.4545**	<.0001	2.3731**	<.0001
AGE	1	0.0401**	<.0001	0.0505	<.0001	0.0429**	<.0001
AGE	2	0.0130**	<.0001	0.0005	0.8208	0.0126**	<.0001
MALE	1	0.2514**	<.0001	0.2196	0.1811	0.2409**	0.0001
MALE	2	−0.0092	0.8793	0.0219	0.7747	−0.0108	0.8428
LAB	1	−0.0069	0.5640	−0.1055	0.3136	−0.0065	0.5931
LAB	2	−0.0178	0.4084	−0.1266	0.3157	−0.0196	0.3760
FNNW	1	0.0620**	<.0001	0.0333**	<.0001	0.0972**	<.0001
FNNW	2	0.0068**	<.0001	0.0026*	0.0964	0.0086**	<.0001
COLLEGE	1	0.6483**	<.0001	1.1283**	0.0001	0.6874**	<.0001
COLLEGE	2	0.2321**	0.0015	0.5342*	0.0607	0.2591**	0.0003
GRAD	1	0.8581**	<.0001	1.5203**	<.0001	0.9398**	<.0001
GRAD	2	0.2935**	0.0002	0.6518*	0.0208	0.3478**	<.0001
R2	1	0.1333**	0.0498	−0.0842	0.5497	0.1361**	0.0447
R2	2	−0.0052	0.9329	−0.3427**	0.0166	−0.0069	0.9095
R3	1	−0.2317**	0.0006	−0.0158	0.8438	−0.1842**	0.0061
R3	2	−0.1768**	0.0045	−0.2727*	0.0504	−0.1489**	0.0147
R4	1	−0.9591**	<.0001	−0.5153**	0.0081	−0.8966**	<.0001
R4	2	−0.3350**	0.0003	−0.3821*	0.0585	−0.3292**	0.0003
FINANCE	1	0.2378**	<.0001	0.2940**	0.0009	0.2559**	<.0001
FINANCE	2	0.0257	0.5025	0.0252	0.7811	0.0260	0.4854
DIV	1	NA	NA	0.7039**	<.0001	NA	NA
DIV	2	0.5130**	<.0001	0.0033	0.7471	0.5336**	<.0001
OWNMGAC	1	2.0811**	<.0001	−0.3516	0.4029	2.2076**	<.0001
OWNMGAC	2	0.1377	0.3006	−0.5954	0.1443	0.1218	0.3454
NTRADE	1	0.0535**	<.0001	0.0115**	<.0001	0.0735**	<.0001
NTRADE	2	0.0054**	<.0001	0.0033**	0.0135	0.0057**	<.0001
OPTIM	1	−0.0060	0.8291	0.0805	0.3861	0.0032	0.8457
OPTIM	2	0.0098	0.7553	0.1259	0.1832	0.0292	0.4630
PES	1	0.0743	0.1057	0.1581	0.1321	0.0957**	0.0326
PES	2	0.0759*	0.0915	0.0559	0.6034	0.0782*	0.0690
HIGH INT	1	0.0076	0.8140	−0.0432	0.6471	0.0020	0.8270
HIGH INT	2	0.0003	0.7847	−0.0568	0.5533	0.0029	0.7873
LOW INT	1	0.0540	0.4993	−0.0976	0.6125	0.0389	0.6167
LOW INT	2	0.0739	0.3856	−0.1010	0.5965	0.0613	0.4486
Y95	1	−0.1671**	0.0051	−0.3168**	0.0066	−0.1980*	0.0005
Y95	2	0.0093	0.8706	−0.0399	0.6965	0.0080	0.8541
Y98	1	−0.2248**	0.0001	−0.6996**	<.0001	−0.3122**	<.0001
Y98	2	−0.0635	0.2572	−0.2687**	0.0424	−0.0913*	0.0880
Y01	1	−0.2958**	<.0001	−0.8997**	<.0001	−0.3895**	<.0001
Y01	2	−0.1571**	0.0047	−0.3267**	0.0160	−0.1813**	0.0010
Y04	1	−0.2243**	0.0002	−0.7780**	<.0001	−0.3279**	<.0001
Y04	2	−0.0787	0.1535	−0.2003	0.1289	−0.1145**	0.0327
No. of obs.		20241		20241		20241	

** Significance at 5%. * Significance at 10%.

Pooled data from the Survey of Consumer Finances, 1992 through 2004. The dependent variable takes on one of three values (function #): zero - not holding any stocks (bonds, assets) directly; 1 - holding domestic stocks (bonds, assets) only; 2 - holding foreign stocks (bonds, assets). The explanatory variables are: AGE - age of the head of household; MALE indicates whether head of the household is male. LAB - labor income as a fraction of total income; FNNW - financial net worth; COLLEGE - indicates at least one year of undergraduate education; GRAD - indicates at least one year of graduate education; R2-R4 degree of risk-aversion (from low to high); FINANCE - working in the finance industry; DIV - indicates whether the number of directly held stocks falls into the optimal range (20–50); CS - share of the company stock in directly held equities; OWNMGAC - ownership of margin accounts; NTRADE - frequency of trades in a brokerage account; OPT (PES) optimistic (pessimistic) about the prospects for the U.S. economy; HIGH INT (LOW INT) expect higher (lower) interest rates in five years from the time of survey.

Table 5 Tobit models: share of foreign stocks and bonds

	Share of foreign stocks		Share of foreign bonds		Share of foreign stocks or bonds	
	Estimate	*p*-value	Estimate	*p*-value	Estimate	*p*-value
INTERCEPT	−0.5368**	0.0000	−1.1696**	0.0001	−0.6080**	0.0000
AGE	0.0011	0.1131	−0.0004	0.8647	0.0019**	0.0014
MALE	−0.0008	0.9781	0.0012	0.9919	−0.0124	0.6448
LAB	−0.0029	0.4668	−0.0125	0.6722	−0.0032	0.4391
FNNW	0.0014**	0.0000	0.0011*	0.0893	0.0011**	0.0000
COLLEGE	0.0696**	0.0424	0.3854**	0.0343	0.1009**	0.0007
GRAD	0.0998**	0.0046	0.5122**	0.0054	0.1506**	0.0000
R2	−0.0177	0.5841	−0.2763**	0.0123	−0.0264	0.3584
R3	−0.0874**	0.0065	−0.1978*	0.0662	−0.0804**	0.0060
R4	−0.1114**	0.0137	−0.2704*	0.0787	−0.1312**	0.0008
FINANCE	0.0121	0.5417	0.0377	0.5543	0.0004	0.9794
DIV	0.1675**	0.0000	−0.0170	0.8087	0.1728**	0.0000
CS	−0.4969**	0.0000				
OWNMGAC	0.0155	0.6481	−0.2215	0.1438	0.0123	0.6917
NTRADE	0.0010**	0.0000	0.0012**	0.0249	0.0011**	0.0000
OPTIM	0.0063	0.7590	0.0975	0.1525	0.0149	0.4088
PES	0.0366	0.1244	0.0053	0.9465	0.0284	0.1632
HIGH INT	0.0108	0.6207	−0.0347	0.6235	0.0050	0.7963
LOW INT	0.0572	0.1734	−0.0888	0.5217	0.0284	0.4190
Y95	0.0093	0.7489	−0.0099	0.9091	0.0100	0.6915
Y98	−0.0173	0.5403	−0.1756*	0.0644	−0.0309	0.2098
Y01	−0.0401	0.1559	−0.1734*	0.0604	−0.0415*	0.0928
Y04	−0.0168	0.5518	−0.0811	0.4015	−0.0261	0.2934
No. of obs.	6668		2232		7054	
Log likelihood	−2395		−578		−2524	
Pseudo R2	0.10		0.04		0.07	

** Significance at 5%. * Significance at 10%.

Notes. Pooled data from the Survey of Consumer Finances. The dependent variable is the share of foreign stocks (bonds, stocks, or bonds) in directly held equities (bonds, stocks, and bonds). Repeated Imputation Inference (RII) (Montalto and Sung, 1996) was employed in the estimation. The explanatory variables are: The explanatory variables are: AGE - age of the head of household; MALE - indicates whether head of the household is male. LAB - labor income as a fraction of total income; FNNW - financial net worth; COLLEGE - indicates at least one year of undergraduate education; GRAD - indicates at least one year of graduate education; R2-R4 - degree of risk-aversion (from low to high); FINANCE - working in the finance industry; DIV - indicates whether the number of directly held stocks falls into the optimal range (20–50); CS - share of the company stock in directly held equities; OWNMGAC - ownership of margin accounts; NTRADE frequency of trades in a brokerage account; OPT (PES) - optimistic (pessimistic) about the prospects for the U.S. economy; HIGH INT (LOW INT) - expect higher (lower) interest rates in five years from the time of survey.

Overall, we can conclude that the results of multinomial logit regressions confirm our findings from probit models.

6.3. Tobit models

Next, we study the proportion of foreign stocks and foreign assets in the portfolio of directly held stocks, bonds, and stocks or bonds (assets), respectively. These proportions

serve as dependent variables. Because less than 12% of stockholders own foreign stocks and less than 6% of bondholders own foreign bonds, we employ a tobit model to handle the left-censored dependent variables.

After having looked at the likelihood of foreign asset ownership, we would like to see whether the same set of independent variables can explain the percentage share of foreign assets in household portfolios of directly held stocks and bonds. The results of the three tobit models are presented in Table 5.

The first model attempts to explain the share of foreign stocks in directly held equities. Qualitatively, these results resemble those from the probit model for the likelihood of foreign stock ownership. Almost all explanatory variables that are significant in the probit model have the same signs and are statistically significant in the tobit model as well, with the exception of AGE, which lost its significance. Therefore, we can report that the proportion of foreign stocks can be explained to some extent by investor's financial sophistication and awareness of diversification benefits. Financial net worth, risk aversion, and overconfidence (as measured by NTRADE variable) are important as well.

In the second model, the dependent variable is the proportion of foreign bonds in directly held bonds. This is why we have to drop CS variable from the regression as it exists only in the sample of stockholders. The model results demonstrate that more educated, wealthier, less risk-averse investors, as well as frequent traders hold higher percentage of foreign bonds in their bond portfolio. These are the same variables that explain the likelihood of holding foreign bonds in the probit regression. However, FNNW and R4 (the highest level of risk-aversion) are significant at ten percentage only in the tobit model. Finally, investors' expectations about domestic interest rates and the domestic economy do not appear to be related to the proportion of foreign bonds in bond portfolios.

The results of the third tobit model, which seeks to explain the share of foreign stocks and bonds in directly held stocks and bonds are similar to the results of the first tobit model with the exception of AGE variable, which is positive and significant in the third model but is insignificant in the first one. Unlike the results of probit and multinomial logit regressions, PES variable (pessimistic expectations of the domestic economy) is not significant in tobit models.

7. Conclusion

In this paper, we study the behavior of active individual investors who invest directly in foreign securities. Using the SCF, we determine the demographic, financial, and behavioral characteristics that predict the likelihood of investments in foreign stocks and bonds. Our results help shed light on the home bias puzzle and the behavior of individual investors. They also have important implications for financial advisors and policy makers as to who diversify internationally and whether the investment decisions are suitable.

The paper's main contributions are as follows. First, we establish the impact of an individual investor's financial, demographic, and behavioral characteristics on the preference for foreign securities using a detailed and representative source of micro data. Second, although there is significant home bias for the vast majority of U.S. households, within the

group of active foreign stockholders, the average ratio of foreign to total directly held stocks does lie within the prescribed range of 30% to 50%. Hence, if we were to include other forms of foreign asset holdings, say through pension accounts and mutual funds, we can safely conclude that home bias is not a phenomenon across the board. This type of heterogeneity is masked by only looking at aggregate data. Third, to our knowledge, this is the first paper that studies the preference for foreign bonds at the individual investor level.

Although there still seems to be no comprehensive answer to the home bias puzzle, we offer a few explanations from an active individual investor's perspective. The empirical results reported in this paper give us a rather consistent picture of factors associated with holdings of foreign securities by U.S. investors. Using various proxies, we find evidence supporting the hypotheses that investors' lack of financial sophistication, as well as lack of awareness of the benefits to diversification negatively affects the likelihood of foreign stocks ownership and their proportional amount in portfolios. Further, pessimistic expectations about the performance of the domestic economy often play a role in increasing the likelihood of foreign asset ownership. Interestingly, when expectations are optimistic, investors do not seem to be motivated to reduce their foreign asset holdings. One possible explanation of this asymmetry is that most investors invest abroad to diversify, not to time the market. Other investor characteristics that are related to the likelihood and/or the extent of home bias in equities are age, financial net worth, risk-aversion, overconfidence, and education.

We find that the probability of ownership of foreign bonds and their share in bond portfolios are explained mostly by the same factors that explain the ownership of foreign stocks, with the following exceptions. Investor's age and our proxy for awareness of diversification benefits turn out to be insignificant in the bonds' models. On the other hand, investors with average risk-aversion are significantly less likely to own foreign bonds than those with low risk-aversion. Finally, expectations about future domestic interest rates have no significant influence on foreign bonds holdings.

Notes

1. According to the Bank of New York, annual dollar volume of listed ADRs has grown from $75 billion in 1990 to $852 billion in 2004. The total number of ADR programs in 2004 has reached 1858, representing issuers from 73 countries.
2. Focusing on the role of informational asymmetry, Ahearne et al. (2004) argue that poor quality and low credibility of financial data in many countries prevents U.S. investors from holding more foreign stocks. By listing on U.S. stock exchanges through American Depositary Receipts (ADRs), however, foreign firms adopt American accounting and disclosure standards, and encourage domestic investors to invest in their stocks by reducing information barriers.
3. A potential caveat is that many U.S. companies are multinationals, so even if the headquarter of company is located in the United States, its revenues may be derived from several countries, and hence the company can be considered partially foreign. Unfortunately, it is not possible to distinguish between multinationals and purely

domestic companies in the SCF, because households are not asked to provide the names of their security holdings.

4. The participants of a large 401(k) plan studied by Agnew et al. (2003) had only four choices of mutual funds in 1994 through 1998. According to Benartzi and Thaler (2001), the average number of investment options in the DC plans in their sample was 6.8. One exception, however, is a large array of 450 funds available in Swedish pension system, used in Karlsson and Norden (2007).
5. Imputation involves the 'filling in' of missing data with plausible values. Multiple imputation is a Monte Carlo technique in which the missing values are replaced by multiple simulated versions. In the case of the SCF, there are five such versions, or five such implicates. See Kennickell (1998) for a discussion of multiple imputations in the SCF.
6. In our multivariable analysis below, we use several proxies for financial sophistication and awareness of diversification benefits.
7. The range for optimal diversification from 20 to 50 stocks was chosen based on recommendations by several papers. While earlier studies (e.g. Evans and Archer, 1968; Bloomfield et al., 1977; Statman, 1987) suggest that a portfolio with 20 to 40 randomly selected stocks is sufficiently diversified, some later papers recommend a higher number because of increased stocks' volatility in 1980s and 1990s. For example Campbell et al. (2001) report that 50 stocks are required now to attain the same level of diversification that was possible with only 20 stocks earlier. Our results are robust to changing the upper level of the optimal range to 40 or 60 stocks.
8. The reason why education level is not a continuous variable is the following. The difference between education levels 12 and 11 (high school) does not have the same significance as the difference between 13 and 12 (first year of college and high school) or between 17 (maximum education level in the SCF corresponding to graduate education) and 16 (college degree).
9. Alternatively, margin account owners can be viewed as aggressive traders, as reported by Andrade et al. (2005) based on Taiwanese data.
10. One may argue that some executives receive stock options as part of their compensation package, and may therefore have to hold higher than optimal amounts of their CSs involuntarily. In this case, the higher CS holdings are not indicative of their awareness of diversification benefits. We address this concern by including an interaction variable of option holdings and the proportion of CS in our models, as well as by running the models on the subsamples of those who receive stock options and those who do not. In both cases, the CS variable still proves to be statistically significant.
11. The self-reported levels of risk-aversion in the SCF are the following: 1 – Take substantial financial risks expecting to earn substantial returns; 2 – Take above average financial risks expecting to earn above average returns; 3 – Take average financial risks expecting to earn average returns; 4 – Not willing to take any financial risks.
12. Replacing the risk-aversion dummy variables with a single continuous variable yields

qualitatively similar results: the coefficient is negative and significant in all of the models.

13. Our results are robust to changing the lower ownership threshold to $50 and $200.

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