# The Role of Institutional Investors in International Trading: an Explanation of the Home Bias Puzzle*

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**Abstract**

We postulate that the growing participation of institutional investors in capital markets along with their particular objective function might help to explain the home equity bias puzzle. We model an institutional investor as a risk averse investor that maximizes expected utility resulting from the difference between final wealth and an exogenously given index formed exclusively by domestic securities. We study the effects of this optimal strategy on a simple one-period equilibrium and obtain a multibeta CAPM. We test this model using data from six countries and we show that the index helps to explain the excess return of domestic securites.

The increase in transnational investments experienced in the last decade has resulted in a large number of empirical studies on exchange rate behavior and portfolio selection[1]. Among the empirical regularities observed, the so called home equity bias [French and Poterba (1991), Adler and Jorion (1992) and Tesar and Werner (1995)] seems to have attracted most of the attention. These papers show that domestic investors holdings of international securities are not consistent with an optimal investment strategy: agents invest in domestic securities a larger proportion of their portfolio than it would be optimal according to portfolio theory. Other studies [Grubel (1968), Levy and Sarnat (1970), Jorion (1985) and Van Wincoop (1994)] have also documented the potencial welfare gains of international diversification.

An equilibrium model with perfect markets and no frictions at all would yield no differences in investment opportunity sets across countries and, therefore, could not account, in principle, for the empirical regularities documented in the literature.

In order to explain this puzzle, different approaches have been suggested. In general, frictions either in consumption or in financial markets are introduced so as to separate investment opportunities sets across countries as a way to induce home biased portfolios in an equilibrium framework.

Black (1974) and Stulz (1981b), for example, introduce barriers to international capital flows in equilibrium models of international asset pricing. Uppal (1993) develops a two-country, general equilibrium model where it is costly to transfer capital across

[1] For a survey see Stulz (1995).

countries. This cost gives rise to endogenous deviations from the law of one price and, therefore, allows different optimal portfolios for home and foreign investors. Empirically observed portfolio allocations will nevertheless be attained only if investors had very low levels of risk aversion. A similar result is reached by Cooper and Kaplanis (1994) when they test for PPP deviations in an Adler and Dumas (1983) type of model combined with deadweight costs on foreign investment.

However, Tesar and Werner (1995) show that portfolio turnover rates are higher on foreign than on domestic portfolios which seems to be at conflict with the explanation of the home bias that relies on barriers to crossborder capital mobility. Besides, they find international investment positions of institutional investors to be well below current legal limitations on foreign asset holdings of these investors.

The non-traded goods literature [Tesar (1993) and Svensson and Werner (1993)] has also approached this problem. Serrat (1996) develops a two-country, general equilibrium model with non-traded goods and complete markets. The supply of non-traded goods plays the role of an additional state variable that generates different hedging demands across countries.

Finally, Brennan and Cao (1996) present a model of international equity portfolio investment flows based on differences in information between foreign and domestic investors.

In this paper we try to provide a different explanation of the home equity bias puzzle. The main arguments in our model come from the observation of two well documented regularities, namely,

- the growing weight of institutional investors in equity markets and
- the agency problems between individuals (households) and institutional investors that results in a different target of the latter type of investors and, arguably, of the representative investor in the markets.

Brennan (1995) draws attention to both facts in a domestic closed economy framework. Regarding the first point, Brennan shows a permanent decline in the share of U.S. equities held directly by individual investors in the United States since World War II (to a current ratio below 50 percent). A parallel increase in the ratio of mutual funds to direct holdings of U.S. equities (rising from a negligible amount in 1970 to about 25 percent in 1990) has been reported by Sirri and Tufano (1993).

Tesar and Werner (1995) show that the portfolios of institutional investors mirror the proportions of foreign securities in average national portfolios in the case of Canada, Germany, Japan, UK and the US. It then seems that both institutional and individual investors are equally affected by the home bias. However, it seems difficult to accept that some of the reasons argued to explain this puzzle might apply to institutional and individual investors in the same form. For example, transaction costs or incomplete information. While these might be important factors in the case of an individual investor, probably will not be crucial for a, say, mutual fund.

Although institutional investors are probably at the vanguard of overseas investment the empirical regularities pointed above seem to imply that holdings of these investors (arguably the "representative agent") are still lower than standard theory of optimal diversification would suggest.

We then arrive to the second point stated above: it has been argued that the objective of institutional investors regarding their portfolios is different from the objective of households: "Most mutual-fund managers actively buy and sell stocks in a bid to beat the market. Index-fund managers, called passive investors, seek simply to match the performance of market indexes, such as the Standard & Poor's 500." [2] This behavior implies that, while households will be interested in maximization of final wealth, the results of institutional investors will be compared to some benchmark, usually some index of domestic securities. In an open economy context, a benchmark index defined in terms of domestic securities alone (as the *S&P500 Composite* index) can be justified by arguing that no institutional investor wants to go abroad until others have done so. It is too risky in terms of *relative* performance. Therefore, while the objective of a representative household can be modeled as the maximization of expected utility (an increasing and concave function, in order to accomodate risk aversion) of final wealth we assume, in the spirit of Brennan (1995), that the institutional investor tries to maximize utility (same type of function) of final wealth minus a benchmark.

In our model there is only one consumption good. Markets are perfect. There are no transaction costs, no taxes, no restrictions on short-sales, no barriers to international investment. Each investor is a price-taker, has the same information and is risk-averse. In a one-period model, for constant absolute risk-aversion utility function, we compare the optimal portfolio of both types of investors. In fact, it is not straightforward to conclude that such objective induces a home bias. The bias will obtain for certain (and plausible) combinations of the volatilities of domestic and foreign securities and the covariances between the domestic and international securities.

In order to test the previous model, we derive a one-period two country pure exchange equilibrium. We obtain a multibeta CAPM . As in classic international versions of CAPM, part of the excess return of a security is explained by the excess return of both the domestic and international markets. But we also obtain a beta that takes into account the benchmark. This model is empirically testable . We use securities and market indices of six countries (including the US). As a benchmark we use the *S&P500 Composite*. We have data from January 1977 to July 1996. We split the sample in two subperiods, January 1977 to December 1987 and January 1988 to July 1996. There is a clear change in the benchmark index beta that relates excess returns for the first subperiod and the second subperiod. In the second subperiod, that corresponds to the empirical works mentioned at the beginning of the introduction (and when the weight of institutional investors is at its maximum) the benchmark seems necessary in order to explain the excess return of domestic securities.

[2] *The Wall Street Journal* [January 28, 1997, p. A1].

In summary, although we believe that market frictions such as transaction costs and incomplete information might have been appropriate explanations of the home equity bias in the past, we do not think they are the key factors now. We postulate that the growing participation of institutional investors (that can probably be considered the "representative agent" of today) along with their particular objective function are important reasons to explain the home bias puzzle. The empirical test we perform seems to support our conjecture. We must emphasize that in this analysis we do not try to investigate why the objective of institutional investors is such, but we take it as given, as it is conventionally accepted.

The paper is organized as follows: in Section I we present the partial equilibrium. In Section II we present the equilibrium result. Section III is devoted to the empirical test and an analysis of the results. We close the paper with some conclusions.

# I Partial Equilibrium

In this section we study the optimal portfolio choice of a risk-averse institutional investor. In order to keep the model as simple as possible, we consider one period ($t_0$ is the initial date and $t_1$ the date the uncertainty is resolved). As we explained in the introduction, we assume that the institutional investor cares about the difference between the outcome of the portfolio and the result of a benchmark portfolio (index).

We first consider the problem of a representative household. We will conclude that there is a home bias if the holdings of the institutional investor deviate (investing a greater proportion in the domestic securities) from the holdings of the representative household. At $t_0$ the investor is endowed with an initial wealth $\mathcal{W}_0$ she allocates among three different assets (two domestic assets and one foreign); we will denote by $R = (R_i),\ i \in \{x, y, z\}$ the vector of returns, where $x$ and $y$ are the returns of the domestic securities and $z$ represents the return of the foreign security. The consumption good will be the numeraire of the economy. We assume $R \sim N(\mu, \Omega)$. This investor only cares about final wealth (i.e., there is no consumption at $t_0$).

We assume a constant absolute risk-aversion utility function defined over final wealth $\mathcal{W}_1$, $U(\mathcal{W}_1) = -exp[-(\pi/\mathcal{W}_0)\mathcal{W}_1]$ where $\pi$ is the coefficient of risk-aversion.

Therefore, the problem faced by the household is:

$$\max_{\omega} \quad E_{t_0}[U(\mathcal{W}_1)] \tag{1}$$

$$s.t.\ \mathbf{1}'\omega = 1 \tag{2}$$

where $\omega' = (\omega_x, \omega_y, \omega_z)$ is the vector of wealth weights invested in the three existing securities and $\mathbf{1}$ is a column vector of ones. Given the assumptions about the utility function and the distribution of the rates of return, this problem is equivalent to:

$$\max_{\omega} -exp[-\pi(\omega'\mu - (1/2)\pi\omega'\,\Omega\,\omega)] - \lambda(\omega'\mathbf{1} - 1), \tag{3}$$

with $\lambda$ the Lagrange multiplier.

The first order condition of problem (3) yields:

$$\omega = \pi^{-1}\Omega^{-1}(\mu - \lambda\mathbf{1}) \tag{4}$$
$$\mathbf{1}'\omega = 1. \tag{5}$$

From both equations we obtain $\lambda = (\mu'\Omega^{-1}\mathbf{1} - \pi)(\mathbf{1}'\Omega^{-1}\mathbf{1})^{-1}$. We denote by $\mu_{mvp} = \mu'\Omega^{-1}\mathbf{1}(\mathbf{1}'\Omega^{-1}\mathbf{1})^{-1}$ and $\sigma^2_{mvp} = (\mathbf{1}'\Omega^{-1}\mathbf{1})^{-1}$ the return and variance, respectively, of the minimum variance portfolio ($mvp$ ). Equations (4) and (5) then become[3]

$$\lambda^h = \mu_{mvp} - \pi\sigma^2_{mvp} \tag{6}$$
$$\omega^h = \pi^{-1}\Omega^{-1}\left[\mu - (\mu_{mvp} - \pi\sigma^2_{mvp})\mathbf{1}\right]. \tag{7}$$

We now introduce the problem of the institutional investor that we will compare with the previous solution. We change the objective function in the following way: we assume that the institutional investor is characterized by a different constant absolute risk-aversion utility function also defined over final wealth $\mathcal{W}_1$, but compared to the outcome of an index,

$$U(\mathcal{W}_1) = -exp[-\pi\left(\mathcal{W}_1 - \mathcal{W}_M\right)/\mathcal{W}_0].$$

We define the index $\mathcal{W}_M$ as

$$\mathcal{W}_M = \mathcal{W}_0[\phi R_x + (1-\phi)R_y],$$

with $\phi$ a number between 0 and 1.

$\mathcal{W}_M$ represents the final wealth attainable through a market index portfolio $\phi$ strategy. We assume that the investor takes $\phi$ as exogenously given.

This new problem is equivalent to the problem defined by equations (1) and (3) if we rewrite $\omega'$ as $\underline{\omega}' = (\omega_x - \phi, \omega_y - (1-\phi), \omega_z)$ and change the restriction (2) into $\mathbf{1}'\underline{\omega} = 0$. The first order condition yields results analogous to equations (4) and (5).

The solution to the previous problem becomes,

$$\lambda^i = \mu_{mvp} \tag{8}$$
$$\omega^i = (\phi, 1-\phi, 0)' + \pi^{-1}\Omega^{-1}(\mu - \mu_{mvp}\mathbf{1}), \tag{9}$$

where $i$ indicates institutional investor. We compare equations (7) and (9). The difference between both optimal portfolios can be written as

[3]Superscript $h$ stands for *household.*

$$\left( \omega^i \quad - \quad \omega^h \right) \;=\; \begin{pmatrix} \phi \\ 1-\phi \\ 0 \end{pmatrix} - \sigma^2_{mvp}\Omega^{-1}\mathbf{1}. \tag{10}$$

We want to study the conditions that will yield a home equity bias in portfolio weights. Suppose first that both domestic assets have identical variance ($\sigma_x^2 = \sigma_y^2$); we also assume that the covariances between the foreign security and each of the domestic securities are identical ($\sigma_{xz} = \sigma_{yz}$). Given the simplicity of our model, these assumptions seem harmless. Additionally, as it will become clear in the analysis to follow, they do not seem to affect the qualitative results.

The home bias puzzle we try to address with this model implies that holdings of international securities are smaller than holdings suggested by optimal portfolio theory for a standard investor (our household). Therefore, we want to compare the holdings in the foreign security of both investors. We rewrite the difference between the proportion of initial wealth invested in the foreign security by the household and the proportion invested by the institutional investor. The result is,

$$\left( \omega_z^i \quad - \quad \omega_z^h \right) = -\sigma^2_{mvp}\, \frac{\sigma_x^2(1+\rho_{xy}) - 2\sigma_{xz}}{\sigma_z^2\sigma_x^2(1+\rho_{xy}) - 2\sigma_{xz}^2} \tag{11}$$

where $\rho_{xy}$ represents the correlation coefficient between the domestic securities. A home bias exists if the result of equation (11) has a negative sign. We now study the conditions that will yield such a result.

We define $\beta_{xz} = \sigma_{xz}/\sigma_x^2$.

Therefore, given $\sigma_z^2$, $\sigma_{xz}$ and $\rho_{xy}$, a home bias will exist (that is $\omega_z^i < \omega_z^h$) if and only if $\beta_{xz}$ does not belong to the following intervals

$$\beta_{xz} \notin \left( \tfrac{1+\rho_{xy}}{2}, \tfrac{1+\rho_{xy}}{2}\tfrac{\sigma_z^2}{\sigma_{xz}} \right) \quad \text{when } \sigma_z^2 > \sigma_{xz} > 0$$

$$\text{or} \tag{12}$$

$$\beta_{xz} \notin \left( \tfrac{1+\rho_{xy}}{2}\tfrac{\sigma_z^2}{\sigma_{xz}}, \tfrac{1+\rho_{xy}}{2} \right) \quad \text{otherwise.}$$

The home equity bias takes place for low or high values of $\beta_{xz}$. The intuition seems to be that low values of $\beta_{xz}$ imply low correlation between the domestic and the international security and then it becomes very risky to invest in it since the chance of a large deviation from the benchmark (including only domestic securities) increases. Also, when $\beta_{xz}$ is high the covariance between domestic and international

Figure 1: **Values of $\beta_{xz}$ that yield a Home Bias**

| | $\sigma_z^2 > \sigma_{xz} > 0$ | | $\sigma_z^2 < \sigma_{xz}$ |
|---|---|---|---|
| $\rho_{xy} = -1$ | | $\omega_z^i < \omega_z^h \; \forall \beta_{xz} \in \Re_{++}$ | |
| $\rho_{xy} = 0$ | $\beta_{xz} \notin \left(\frac{1}{2}, \frac{\sigma_z^2}{2\sigma_{xz}}\right)$ | | $\beta_{xz} \notin \left(\frac{\sigma_z^2}{2\sigma_{xz}}, \frac{1}{2}\right)$ |
| $\rho_{xy} = 1$ | $\beta_{xz} < 1$ | | $\omega_z^i > \omega_z^h \; \forall \; \beta_{xz} \in \Re_{++}$ |

security is high relative to the variance of the domestic security which only can be the result of a high variance of the international security relative to the variance of the domestic security which makes risky to invest in it.

In Figure 1 we present the ranges of $\beta_{xz}$ for which $\omega_z^i < \omega_z^h$ given $\sigma_z^2$, $\sigma_{xz}$ and some representative values of $\rho_{xy}$.

See for example that, when the domestic securities are positively and perfectly correlated (equivalent to assume the domestic market consists of only one security), the home bias arises only for high volatility of the foreign security and low $\beta_{xz}$ (which means high volatility of the domestic security respective to the covariance); for low volatility of the foreign security there will be international bias: the institutional investor (for diversification reasons) will always invest more in the international security that the benchmark investor.

We now consider the case $\sigma_z^2 = \sigma_{xz}$. It is straightforward to show that, under such additional assumption, $\mu_{mvp} = \mu_z$ and $\sigma_{mvp}^2 = \sigma_z^2$. The difference (10) between both optimal portfolios would then be

$$\left( \omega^i \quad - \quad \omega^b \right) \quad = \quad \begin{pmatrix} \phi \\ 1-\phi \\ -1 \end{pmatrix}. \tag{13}$$

The interpretation is that the institutional investor would shortsell the foreign security and reinvest the proceedings in the domestic market replicating the market index portfolio.

Finally, we consider the following case: there are two securities in the domestic market, a risky asset with return $R_x \sim N(\mu_x, \sigma_x^2)$ and a riskfree asset with return $r$. There is also one foreign risky security with return $R_z \sim N(\mu_z, \sigma_z^2)$. The notation is as before, but now the second component of the vector $\omega$ of weights represents investment in the domestic riskfree security. The index portfolio is formed only by the domestic risky security (equivalent to $\phi = 1$).

Under these assumptions, $\lambda^i = \lambda^h = \mu_{mvp} = r$ and the difference between both portfolios becomes

$$\left( \omega^i \quad - \quad \omega^h \right) \quad = \quad \begin{pmatrix} 1 \\ -1 \\ 0 \end{pmatrix}. \tag{14}$$

The institutional investor also replicates the index portfolio, but now borrows from the domestic market at the riskfree rate $r$; this implies no disinvestment from the foreign market (compared to the benchmark case) and therefore $\omega_z^i = \omega_z^h$.

Therefore, an institutional investor whose utility function is as stated above will optimally invest in foreign securities a smaller proportion of the portfolio than an individual investor that maximizes expected utility over final wealth given that some conditions are satisfied.

In the next section we extend the partial equilibrium model to a general equilibrium setting that yields testable results.

# II Equilibrium

In this section we extend the previous setting to a simple one-period equilibrium model. The framework is an open economy with perfectly integrated capital markets. We first solve for the optimal portfolio of the representative agents in the economy. We assume that the market capitalization value and market indices of domestic and foreign markets are known. In equilibrium, supply equals demand and capital markets clear.

Our target is to derive an empirically testable model that might support the importance of the role of institutional investors in international trading. For other equilibrium models in the international finance literature see Adler and Dumas (1983), Basak and Gallmeyer (1996), Sercu (1980), Solnik (1974), Stulz (1981a) and Zapatero (1995).

## II.A The Agents

We consider a pure exchange open real economy that consists of two countries. There is only one consumption good. We will use subscript $D$ for the domestic country while $F$ will stand for the foreign country. We will assume international capital markets to be perfectly integrated and all agents to have the same investment opportunity set.

Investors are either households or institutional investors. Both kinds of agents have a constant absolute-risk-aversion utility function defined over period $t_1$ final wealth. Without loss of generality, we will assume all agents have the same degree of risk-aversion, regardless of their nationality. Households and institutional investors, however, differ in the argument of their respective utility functions.

At time $t_0$, a representative household $h$ is endowed with an initial wealth $\mathcal{W}_0^h$ she can invest both in domestic and overseas financial markets so as to maximize her time $t_1$ expected utility over final wealth $\mathcal{W}_1$. The representative household $h$ utility function is of the form

$$U^h(\mathcal{W}_1) = -exp[-(\pi/\mathcal{W}_0^h)\,\mathcal{W}_1],$$

where $\pi$ represents the constant coefficient of absolute-risk-aversion.

By analogy, at time $t_0$, a representative institutional investor $i$ is endowed with wealth $\mathcal{W}_0^i$ that can be allocated either in domestic or foreign financial markets so as to maximize time $t_1$ expected utility over final wealth $\mathcal{W}_1$. The utility function of the domestic institutional investor $i$ is

$$U^i(\mathcal{W}_1) = -exp[-(\pi/\mathcal{W}_0^i)(\mathcal{W}_1 - \mathcal{W}_M)].$$

By $\mathcal{W}_M$ we denote the final consumption attainable through a benchmark portfolio strategy $\phi$.

## II.B Financial Markets

Domestic and foreign assets are in positive net supply. We will denote by $X_D$ ($X_F$) the number of risky assets in the financial market of the domestic (foreign) country.

Given that definition, any agent can choose her optimal portfolio over a total number $X = X_D + X_F$ of assets. We assume that all returns are distributed as a normal multivariate with mean return $\mu$ and variance-covariance matrix $\Omega$.

Besides the risky assets, domestic (foreign) households can also invest in a locally riskless asset with return $r_D$ ($r_F$). The riskless asset is supposed to be in zero net supply.

## II.C Optimal Investment

We shall use $\omega^h$, $\omega^i$ to denote the risky portfolio proportions vectors of the domestic representative household and institutional investor, respectively. Both vectors satisfy $\mathbf{1}'\omega^h = \mathbf{1}'\omega^i = 1$, where $\mathbf{1}$ represents a column vector of ones of suitable dimension.

For notational purposes, we introduce the following innocuous convention: the first $X_D$ weights correspond to investment in domestic country risky assets while the remaining $X_F$ weights correspond to investment in foreign country risky assets.

Domestic household optimal portfolio $\omega^h$ solves the problem

$$\max_{\omega}\,(\omega - r_D\mathbf{1})'\,\mu - (1/2)\,\pi\,\omega'\,\Omega\,\omega - \lambda^h(\omega'\mathbf{1} - 1). \tag{15}$$

The vector $\omega^h$ of optimal portfolio proportions is given by

$$\omega^h = \frac{1}{\pi}\,\Omega^{-1}\,(\mu - r_D \mathbf{1})\,. \tag{16}$$

The optimal portfolio of the institutional investor $\omega^i$ is the result of solving the problem

$$\max_{\omega}\,(\omega - \phi_D)'\mu - (1/2)\,\pi\,(\omega - \phi_D)'\,\Omega\,(\omega - \phi_D) - \lambda^i(\omega'\mathbf{1} - 1), \tag{17}$$

where $\phi_D$ represents the benchmark portfolio of the domestic institutional investor. This benchmark portfolio is made only of domestic risky assets and therefore, the last $X_F$ weights are all zeros.

The vector $\omega^i$ of optimal portfolio weights is

$$\omega^i = \phi_D + \frac{1}{\pi}\,\Omega^{-1}\left(\mu - \lambda^i\,\mathbf{1}\right), \tag{18}$$

where $\lambda^i = \mu'\,\Omega^{-1}\,\mathbf{1}/\mathbf{1}'\,\Omega^{-1}\,\mathbf{1} \equiv \mu_{mvp}$, the minimum global variance portfolio mean return.

## II.D Market Equilibrium

### II.D.1 Demand Side

We define $W_D^h$ and $W_D^i$, the values of the portfolios controlled by the domestic household and institutional investor, respectively. Domestic aggregate demand $D_D$ would be

$$D_D = W_D^h\,\omega^h + W_D^i\,\omega^i. \tag{19}$$

Substituing both portfolios for their values in equations (16) and (18), the domestic aggregate demand equation (19) now becomes

$$D_D = W_D^i \phi_D + H^{-1}\,\Omega^{-1}(\mu - R^*\,\mathbf{1}), \tag{20}$$

where

$$R^* = \frac{\mu_{mvp} W_D^i + r_D W_D^h}{W_D^i + W_D^h}$$
$$H = \frac{\pi}{W_D^i + W_D^h}.$$

$H$ represents the aggregate risk aversion coefficient. For the foreign country, the aggregate asset demands $D_F$ is calculated in the same way. Worldwide aggregate asset demand is therefore given by the vector $D = D_D + D_F$.

### II.D.2 Supply Side

We now introduce $S_D$ ($S_F$), the domestic currency value of the aggregate market portfolio of risky assets for the domestic (foreign) country; $x_D$ ($x_F$) is the domestic (foreign) market portfolio vector of weights. The last $X_F$ rows of the domestic market portfolio vector weights are zeros as well as the first $X_D$ rows of the foreign market portfolio vector.

Therefore, the worlwide asset supply vector $S$ is given by the vector addition

$$S = S_D x_D + S_F x_F.$$

### II.D.3 Market Clearing

We introduce $\theta_{i,j}$ ($i, j \in \{D, F\}$), the proportions of country $j$ market capitalization value owned by investors from country $i$.

Market clearing requires $D = S$ or, equivalently,

$$D_D = \theta_{DD} S_D x_D + \theta_{DF} S_F x_F \tag{21}$$

for the domestic country and

$$D_F = \theta_{FD} S_D x_D + \theta_{FF} S_F x_F \tag{22}$$

for the foreign country, to be satisfied.

In equations (21) and (22) vectors $(\theta_{DD}, \theta_{FD})$ and $(\theta_{DF}, \theta_{FF})$ are such that

$$(\theta_{DD}, \theta_{FD})\mathbf{1} = (\theta_{DF}, \theta_{FF})\mathbf{1} = 1.$$

Substituing (20) into equation (21), the domestic country market clearing implies

$$W_D^i \phi_D + H^{-1}\,\Omega^{-1}(\mu - R^*\,\mathbf{1}) = \theta_{DD} S_D x_D + \theta_{DF} S_F x_F. \tag{23}$$

The last equation can be rearranged as follows:

$$(\mu \quad - \quad R^*\,\mathbf{1}) \;= (\Omega\, x_D \vdots \Omega\, x_F \vdots \Omega\, \phi_D) \begin{pmatrix} H\,\theta_{DD} S_D \\ H\,\theta_{DF} S_F \\ -H\,W_D^i \end{pmatrix}. \tag{24}$$

We introduce some notation to be used next. We will call

$$\begin{aligned} \mu_D &= x_D{}'\,\mu \\ \mu_F &= x_F{}'\,\mu \\ \mu_{\phi_D} &= \phi_D{}'\,\mu, \end{aligned}$$

the return on the domestic, foreign and benchmark indices, respectively.

We will also use $\Sigma_{D,F,\phi}$ to denote the variance-covariance matrix of the domestic, foreign and institutional benchmark indices.

Premultiplying both terms in equation (24) by $(x_D \vdots x_F \vdots \phi_D)'$ we have

$$\begin{pmatrix} \mu_D - R^* \\ \mu_F - R^* \\ \mu_{\phi_D} - R^* \end{pmatrix} = \Sigma_{D,F,\phi} \begin{pmatrix} H\,\theta_{DD} S_D \\ H\,\theta_{DF} S_F \\ -H\,W_D^i \end{pmatrix}. \tag{25}$$

Finally, solving for

$$\begin{pmatrix} H\,\theta_{DD} S_D \\ H\,\theta_{DF} S_F \\ -H\,W_D^i \end{pmatrix}$$

in equation (25) and substituing into equation (24), we can re-write the excess return on risky assets as

$$(\mu \quad - \quad R^* \mathbf{1}) \;= (\Omega\, x_D \vdots \Omega\, x_F \vdots \Omega\, \phi_D)\, \Sigma^{-1}_{D,F,\phi} \begin{pmatrix} \mu_D - R^* \\ \mu_F - R^* \\ \mu_{\phi_D} - R^* \end{pmatrix}. \tag{26}$$

Equation (26) is the counterpart of the traditional Capital Asset Pricing Model when institutional investors are introduced. Together with the excess return on the national markets indices, a new regressor is brought into the analisys, namely the excess return on the benchmark portfolio of the domestic investor.

This equation is straightforward testable with the standard CAPM empirical testing procedures. Empirical confirmation of the previous model would give support to the role of institutional investors as a possible explanation of the home bias. In the context of the work of French and Poterba (1991) a positive benchmark index beta would help to explain the difference between observed excess returns and the excess returns that would justify actual holdings.

# III Empirical analysis

We consider the US capital market as the domestic country. Overseas markets include five countries: Canada, France, United Kingdom, Germany and Japan. As reported by the *Survey of Current Business*, US Departament of Commerce, US stock positions in those countries represented up to nearly seventy percent of total US holdings of foreign stocks in 1995. Using information about these countries we test equation (26).

Figure 2: **US international stock positions as shares of domestic markets capitalization values (in percent)**

| | 1980 | 1985 | 1990 | 1995 |
|---|---|---|---|---|
| Canada | 6.5 | 7.0 | 8.0 | 9.5 |
| France | 0.0 | 4.2 | 3.7 | 5.1 |
| United Kingdom | 0.4 | 1.3 | 2.1 | 4.9 |
| Germany | 3.5 | 3.6 | 4.2 | 6.3 |
| Japan | 0.0 | 0.6 | 0.4 | 2.5 |

## III.A Description of data

Figure 2 shows the US international investment positions in stocks as shares of the capitalization values for the countries included in our analysis, begining in 1980 through 1995. US portfolio positions were calculated by the authors upon 1993 US stock positions in foreign markets from the *Survey of Current Business*, US Department of Commerce and US net purchases of foreign stocks from the US Department of the Treasury, serially adjusted for changes in stock prices and exchange rates.[4] End-of-year stock market capitalizations are from Datastream International.

Market indices of the six countries mentioned above are monthly series begining in January 1977 trough July 1996 from Datastream International. Monthly series of Morgan Stanley Capital International indices were available begining in January 1982. Monthly correlation between indices from both sources, from 1982 to July 1996, was almost perfect. For a disgression on Morgan Stanley indices see Harvey (1991).

As a benchmark portfolio we use the Standard & Poors *S&P500 Composite* return index. The return on the *S&P500 Composite* index was replaced by the residuals from the regression of the same index on the US market return index so as to avoid multicollineality between both indices.

Figure 3 shows the correlations among all countries market rate of return indices and between those indices and the *S&P500 Composite* rate of return index , from January 1977 to July 1996.

As domestic (US) assets we picked the 1992 top thirty seven stocks according to the market capitalization value of the companies. ADRs are used to represent foreign assets in the portfolio of the US investor. For all foreign countries parent shares returns were used. Foreign currencies were converted into dollars using the IMF monthly series of *end of period exchange rate*. International arbitrage guarantees that these returns would be identical to those that would have been obtained using original ADR dollar returns. All assets and indices returns include dividends. For the

[4]We are grateful to Harlen King at the Department of Commerce and Gary Lee at the Department of the Treasury for providing us with the data and for their very helpful comments.

Figure 3: **Correlation Coeficients among Indices. From January 1977 through July 1996**

| | CN | FR | UK | DB | JA | US | S&P |
|---|---|---|---|---|---|---|---|
| Canada | - | 0.34 | 0.48 | 0.21 | 0.23 | 0.72 | 0.15 |
| France | | - | 0.52 | 0.61 | 0.36 | 0.38 | 0.09 |
| United Kingdom | | | - | 0.49 | 0.34 | 0.52 | 0.14 |
| Germany | | | | - | 0.30 | 0.26 | 0.11 |
| Japan | | | | | - | 0.25 | 0.10 |
| US | | | | | | - | 0.00 |
| S&P | | | | | | | - |

Figure 4: **Initial Assets Portfolio**

| Country | Assets |
|---|---|
| Canada | 18 |
| France | 15 |
| United Kingdom | 63 |
| Germany | 19 |
| Japan | 69 |
| US | 37 |

locally risk-free asset, the monthly returns serie of the three months Treasury Bill is used.

The internationally diversified portfolio database is formed by monthly series from January 1977 to July 1996 of 222 risky assets and one (locally) risk-free asset. The number of risky assets from each country is shown in Figure 4.

## III.B Methodology

The sample is divided into two periods: the first period goes from January 1977 to December 1987; the second, from January 1988 to July 1996. Such a division aims to capture the increasing institutionalization experienced by capital markets since the late eighties. This paper argues that the role of institutional investors can help in explaining the home equity bias puzzle. It is also clear that the importance of intitutional investors (with an objective function similar to that described in Sections I and II) has increased continuously over the last decades. By dividing the sample in two periods we can compare the results of the first subperiod with the results of the second subperiod, when insitutional investors were relatively more important. We choose 1987 (because of the stock market crash) as the obvious cutoff point since it is almost the middle point of the series considered.

The general equilibrium model developed in Section II implies, through equation (26), that excess rates of return on assets satisfy

$$\tilde{R}_t^i = \beta_0^i + \sum_{m=1}^{5} R_{m\,t}\beta_m^i + R_{US\,t}\beta_{US}^i + R_{S\&P\,t}\beta_{S\&P}^i + \tilde{\epsilon}_t^i, \ \forall t. \tag{27}$$

As usual, we assume that residual terms $\epsilon$ are i.i.d. and betas, variances and covariances are stationay over time. Harvey and Ferson (1993) also test an international multi-beta CAPM. They focus on the ability of beta pricing models to capture the predictability of international equity market returns through conditional expected risk premia and conditional betas.

As a first exercise, OLS regressions were run for each of the thirty seven US risky assets and the risk-free asset on the six countries market indices plus the *S&P Composite Index*. These regressions were run in both periods of the sample. Results appear in Tables I and II, respectively, in the appendix of this paper.

In order to summarize information and obtain more consistent estimates of the betas, assets were aggregated into portfolios within each country. The criterion followed was first to sort all assets whithin a given country according to the corresponding country market index estimated beta.[5] After that, a relative dispersion measure (based on a moving median of the assets already incorporated into the portfolio) was defined for each bunch of sorted betas; assets were then simply averaged into portfolios within each set of country assets. New regressions were run with portfolio mean returns as the new dependent variables.

For both periods of the sample, the first five years (from January 1977 to December 1981 and from January 1988 to December 1992, respectively) were used to aggregate betas within each country. In Tables III and V in the appendix we show the betas of the portfolios so constructed.

By this procedure, estimated portfolio betas will be indeed highly correlated with real betas, resulting in a minimizaton of the loss of efficiency of the portfolio betas estimates inherent to the gathering process. However, correlation with measurement errors will be equally high which turns, on its time, into a decrease in the consistency of the estimated portfolio betas. A way to avoid this problem is based on non-contemporaneous beta estimates as applied by Blume and Friend (1973), Fama and Macbeth (1973) and Black, Jensen and Scholes (1973): under the assumption of asset returns serially uncorrelated, measurement errors in betas calculated over non-overlapping periods should be uncorrelated.

[5]Grouping stocks according to their country membership is also done by Cho, Eun and Senbet (1986) where they test an International Asset Pricing Model using inter-battery factor analysis.

Table IV the appendix shows the average betas and their corresponding t-values computed for the period January 1982 to December 1987 for the portfolios constructed from information of the period January 1977 to December 1981 (Table III). Similarly Table IV corresponds to the average betas and t-values computed with information of the period January 1993 to June 1996 but for the portfolios constructed for Table V.

Table VII presents the same results as in Tables III-VI but for US portfolios.

### III.C Analysis of the Results

We first compare Tables I and II (betas of the largest thirty seven stocks for both periods considered). There is a sistematic change in the sign of $\beta_{S\&P}$. In the first period (January 1977 to December 1987), twenty eight out of thirty seven risky assets had a negative covariance with the *S&P Composite* index. Seven out of these twenty eight were significant. In the second period (January 1988 to July 1996) there were seventeen risky assets with a positive $\beta_{S\&P}$; thirteen out of them were significant. It is clear that there is an almost general increase in value of both betas and t-values: many securities whose betas were negative have positive betas in the second period or negative betas smaller in absolute value and those who had small positive betas see how their betas increase in value and so do the t-values.

The previous conclusion is reinforced in Table VII, where we report the betas for portfolios of securities. For the reasons stated in Section III.B the most meaningful comparison is between the results for January 1982 to December 1987 and the results for January 1993 to July 1996. For the latter period all portfolios have positive betas with respect to the *S&P Composite* index and all but one are significant. In fact the same pattern shows for the comparison between periods January 1977 to December 1981 and January 1988 to December 1992.

Tables III-VI are useful for comparison purposes. The pattern observed for US stocks is not replicated by portfolios of any other countries. Only Canada (where relative US participation is at its maximum) shows a similar pattern (if we compare Tables IV and VI) but certainly at a smaller scale.

In summary, it seems that for the second period of the sample considered the *S&P Composite* index helps to explain the returns of the US stocks. This is consistent with the institutionalization of capital markets that would justify a home equity bias as described in Section I. In the context of French and Poterba (1991) this model provides a positive second beta (with the *S&P Composite* index) that would imply a lower expected excess return consistent with the actual data.

## IV Conclusions

The so called home equity bias puzzle has drawn a large number of studies over the last years. According to those papers, investors hold a smaller proportion of foreign securities (and therefore a larger proportion of domestic securities) than optimal portfolio strategy would suggest. A number of possible explanations based on barriers to international capital mobility, non-tradable goods, asymmetric information and others have been provided. In this paper we suggest a different reason.

In the spirit of Brennan (1995), a model that includes institutional investors and that assumes that the objective function of this type of investors differs from the objective of households, by caring about the difference between wealth and a benchmark (index), seems to be consistent with market observations. It is straightforward to show that such a model would give rise to a home bias under weak assumptions about the relationship between the volatility of domestic and foreign securities and their covariances.

Our study considers US securities as domestic securities, but it would certainly reinforce our thesis findings of similar results for other countries where institutional investors play an (increasingly) important role.

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TABLE I

Results of the Regressions for US Assets

From January 1977 to December 1987

| ASSET | $\hat{\beta}_0$ | $\hat{\beta}_{CN}$ | $\hat{\beta}_{FR}$ | $\hat{\beta}_{UK}$ | $\hat{\beta}_{G}$ | $\hat{\beta}_{JA}$ | $\hat{\beta}_{US}$ | $\hat{\beta}_{S\&P}$ |
|---|---|---|---|---|---|---|---|---|
| EXXON | 0.25 | -0.07 | 0.12 | 0.07 | 0.03 | -0.15 | 0.76 | 3.82 |
| | (2.61) | (-0.63) | (1.92) | (0.86) | (0.43) | (-2.03) | (5.68) | (3.91) |
| GEN.ELEC. | -0.03 | -0.03 | -0.04 | -0.07 | 0.02 | -0.08 | 1.24 | -0.58 |
| | (-0.35) | (-0.28) | (-0.72) | (-1.02) | (0.28) | (-1.23) | (10.33) | (-0.66) |
| COCA COLA | 0.20 | 0.00 | -0.17 | -0.07 | 0.05 | 0.17 | 0.82 | -1.34 |
| | (1.75) | (0.00) | (-2.28) | (-0.74) | (0.54) | (1.87) | (5.07) | (-1.13) |
| AT&T CORP. | 0.55 | -0.16 | -0.01 | -0.10 | 0.18 | -0.11 | 0.66 | 0.49 |
| | (4.82) | (-1.19) | (-0.16) | (-1.07) | (2.08) | (-1.22) | (4.19) | (0.43) |
| IBM | 0.24 | -0.01 | -0.07 | -0.08 | 0.02 | -0.08 | 0.99 | -1.56 |
| | (2.52) | (-0.12) | (-1.24) | (-0.95) | (0.27) | (-1.13) | (7.39) | (-1.60) |
| BRISTOL MYERS | 0.21 | -0.29 | -0.09 | 0.10 | -0.13 | 0.08 | 1.13 | -2.14 |
| | (1.90) | (-2.26) | (-1.28) | (1.11) | (-1.52) | (0.89) | (7.31) | (-1.90) |
| JOHNSON&J. | 0.05 | -0.21 | -0.06 | -0.04 | 0.03 | 0.14 | 1.09 | -3.34 |
| | (0.46) | (-1.55) | (-0.83) | (-0.42) | (0.34) | (1.55) | (6.73) | (-2.82) |
| DU PONT | -0.05 | 0.00 | -0.09 | -0.01 | 0.08 | -0.07 | 1.14 | 1.20 |
| | (-0.51) | (-0.01) | (-1.43) | (-0.09) | (1.02) | (-0.96) | (8.42) | (1.22) |
| GTE | 0.24 | -0.06 | -0.05 | -0.15 | 0.20 | -0.03 | 0.85 | -2.64 |
| | (2.70) | (-0.57) | (-0.89) | (-2.02) | (2.90) | (-0.43) | (6.86) | (-2.90) |
| ABBOTT LABS. | 0.00 | -0.29 | -0.02 | 0.07 | -0.05 | 0.16 | 1.14 | -3.02 |
| | (0.00) | (-2.02) | (-0.30) | (0.70) | (-0.59) | (1.72) | (6.77) | (-2.46) |
| AMER.HOME PRDS. | 0.24 | -0.18 | -0.06 | -0.06 | 0.11 | 0.07 | 0.89 | -1.95 |
| | (2.12) | (-1.36) | (-0.88) | (-0.64) | (1.22) | (0.81) | (5.65) | (-1.70) |
| LILLY ELI | -0.02 | -0.42 | 0.02 | 0.07 | 0.03 | 0.16 | 1.15 | -0.90 |
| | (-0.13) | (-2.93) | (0.33) | (0.66) | (0.30) | (1.70) | (6.77) | (-0.72) |
| AMOCO | 0.41 | -0.22 | 0.17 | 0.09 | -0.08 | -0.20 | 0.84 | 11.52 |
| | (3.04) | (-1.44) | (2.03) | (0.85) | (-0.76) | (-1.95) | (4.51) | (8.50) |
| CHEVRON | 0.01 | -0.12 | 0.13 | 0.04 | 0.02 | -0.07 | 0.99 | 8.69 |
| | (0.09) | (-0.77) | (1.56) | (0.35) | (0.18) | (-0.64) | (5.15) | (6.22) |
| AMER.INTL.GP. | 0.03 | -0.13 | -0.04 | 0.04 | 0.00 | -0.02 | 1.13 | -3.37 |
| | (0.22) | (-0.83) | (-0.51) | (0.34) | (-0.01) | (-0.17) | (6.29) | (-2.58) |
| FEDERAL NAT. | -0.47 | 0.14 | -0.13 | -0.12 | 0.25 | 0.12 | 1.21 | -8.92 |
| | (-2.63) | (0.66) | (-1.15) | (-0.82) | (1.83) | (0.86) | (4.87) | (-4.93) |
| GENERAL MOTORS | 0.09 | 0.08 | -0.02 | -0.09 | 0.00 | -0.02 | 0.96 | -2.15 |
| | (0.71) | (0.51) | (-0.24) | (-0.80) | (0.01) | (-0.23) | (5.38) | (-1.66) |
| ANHEUSER-BUSCH | 0.03 | -0.28 | -0.19 | 0.13 | 0.11 | 0.16 | 1.05 | -2.59 |
| | (0.20) | (-1.73) | (-2.18) | (1.14) | (1.02) | (1.49) | (5.39) | (-1.82) |
| ATLANTIC RICH. | 0.13 | -0.10 | 0.11 | 0.32 | -0.02 | -0.13 | 0.69 | 9.11 |
| | (0.85) | (-0.55) | (1.17) | (2.41) | (-0.15) | (-1.12) | (3.17) | (5.74) |

TABLE I (Cont.)

RESULTS OF THE REGRESSIONS FOR US ASSETS

FROM JANUARY 1977 TO DECEMBER 1987

| ASSET | $\hat{\beta}_0$ | $\hat{\beta}_{CN}$ | $\hat{\beta}_{FR}$ | $\hat{\beta}_{UK}$ | $\hat{\beta}_G$ | $\hat{\beta}_{JA}$ | $\hat{\beta}_{US}$ | $\hat{\beta}_{S\&P}$ |
|---|---|---|---|---|---|---|---|---|
| BOEING | -0.37 | 0.48 | 0.00 | -0.44 | 0.09 | 0.05 | 1.20 | -2.86 |
| | (-1.91) | (2.13) | (0.00) | (-2.75) | (0.61) | (0.37) | (4.46) | (-1.46) |
| KELLOGG | 0.10 | -0.27 | -0.11 | 0.06 | 0.05 | 0.19 | 0.98 | -2.11 |
| | (0.70) | (-1.64) | (-1.22) | (0.54) | (0.48) | (1.76) | (5.06) | (-1.50) |
| KODAK | 0.19 | -0.30 | -0.01 | 0.14 | -0.14 | -0.14 | 1.27 | -0.16 |
| | (1.47) | (-1.97) | (-0.15) | (1.26) | (-1.41) | (-1.45) | (7.08) | (-0.12) |
| DISNEY | -0.29 | -0.45 | -0.09 | -0.09 | -0.03 | 0.13 | 1.82 | -1.25 |
| | (-1.65) | (-2.20) | (-0.80) | (-0.59) | (-0.24) | (0.98) | (7.44) | (-0.70) |
| DOW CHEMICALS | -0.25 | 0.22 | -0.01 | 0.00 | -0.10 | 0.10 | 1.04 | 1.10 |
| | (-2.19) | (1.68) | (-0.08) | (-0.04) | (-1.18) | (1.10) | (6.60) | (0.96) |
| HEWLETT-PACKARD | -0.30 | -0.05 | 0.06 | -0.14 | -0.27 | 0.07 | 1.62 | -0.32 |
| | (-1.94) | (-0.26) | (0.59) | (-1.08) | (-2.26) | (0.63) | (7.63) | (-0.21) |
| FORD MOTOR | -0.06 | 0.13 | 0.01 | -0.16 | 0.00 | 0.00 | 1.10 | -2.87 |
| | (-0.40) | (0.68) | (0.09) | (-1.21) | (0.01) | (-0.01) | (4.96) | (-1.78) |
| EMERSON ELECTRIC | 0.00 | 0.17 | -0.08 | -0.19 | -0.01 | 0.05 | 1.06 | -1.52 |
| | (0.00) | (1.59) | (-1.38) | (-2.42) | (-0.13) | (0.71) | (8.33) | (-1.64) |
| GILLETTE | -0.10 | -0.03 | -0.24 | 0.17 | 0.31 | -0.02 | 0.92 | -2.81 |
| | (-0.76) | (-0.22) | (-2.96) | (1.55) | (3.07) | (-0.19) | (4.99) | (-2.09) |
| GEN.MILLS | 0.28 | -0.19 | -0.10 | -0.16 | 0.14 | 0.04 | 1.00 | -2.15 |
| | (2.02) | (-1.21) | (-1.20) | (-1.34) | (1.34) | (0.34) | (5.23) | (-1.54) |
| BAXTER INTL. | 0.11 | -0.35 | 0.06 | 0.00 | -0.28 | 0.10 | 1.37 | -4.16 |
| | (0.70) | (-1.96) | (0.65) | (-0.02) | (-2.39) | (0.81) | (6.43) | (-2.67) |
| CAMPBELL SOUP | 0.37 | -0.21 | 0.06 | -0.11 | 0.03 | 0.12 | 0.75 | -0.60 |
| | (2.60) | (-1.29) | (0.70) | (-0.89) | (0.23) | (1.12) | (3.80) | (-0.42) |
| LIMITED | -1.30 | 0.42 | -0.32 | -0.01 | 0.21 | 0.05 | 1.96 | -4.94 |
| | (-4.98) | (1.37) | (-1.95) | (-0.02) | (1.04) | (0.24) | (5.40) | (-1.87) |
| BERKSHIRE HAT. | -0.08 | 0.35 | -0.03 | 0.09 | 0.19 | -0.07 | 0.57 | -0.57 |
| | (-0.45) | (1.76) | (-0.30) | (0.60) | (1.41) | (-0.50) | (2.37) | (-0.33) |
| ARCHER-DANLS. | -0.32 | 0.02 | 0.14 | 0.06 | 0.11 | -0.15 | 1.15 | 1.52 |
| | (-1.83) | (0.07) | (1.30) | (0.40) | (0.80) | (-1.11) | (4.67) | (0.85) |
| DUN & BRADSTREET | -0.13 | -0.01 | -0.06 | -0.11 | 0.00 | 0.17 | 1.15 | -0.82 |
| | (-1.27) | (-0.11) | (-0.98) | (-1.32) | (0.02) | (2.17) | (8.06) | (-0.78) |
| HEINZ & H.J. | 0.16 | -0.26 | 0.03 | -0.14 | 0.11 | -0.06 | 1.16 | -0.53 |
| | (1.26) | (-1.70) | (0.37) | (-1.29) | (1.15) | (-0.57) | (6.43) | (-0.40) |
| INTEL | -0.54 | 0.02 | -0.02 | 0.09 | -0.41 | 0.13 | 1.73 | 0.85 |
| | (-2.46) | (0.07) | (-0.12) | (0.49) | (-2.44) | (0.79) | (5.66) | (0.38) |
| T-BILL | 1.02 | -0.01 | 0.00 | 0.00 | -0.01 | -0.01 | 0.01 | 0.07 |
| | (189.73) | (-1.10) | (-0.27) | (-0.93) | (-1.23) | (-2.00) | (1.63) | (1.23) |

TABLE II

Results of the Regressions for US Assets

From January 1988 to July 1996

| ASSET | $\hat{\beta}_0$ | $\hat{\beta}_{CN}$ | $\hat{\beta}_{FR}$ | $\hat{\beta}_{UK}$ | $\hat{\beta}_G$ | $\hat{\beta}_{JA}$ | $\hat{\beta}_{US}$ | $\hat{\beta}_{S\&P}$ |
|---|---|---|---|---|---|---|---|---|
| EXXON | 0.53 | -0.02 | 0.03 | 0.12 | -0.14 | 0.11 | 0.40 | 2.89 |
| | (4.95) | (-0.21) | (0.30) | (1.46) | (-1.57) | (2.48) | (3.06) | (3.20) |
| GEN.ELEC. | -0.40 | -0.05 | -0.02 | -0.26 | 0.25 | 0.06 | 1.43 | 0.71 |
| | (-3.17) | (-0.39) | (-0.16) | (-2.61) | (2.26) | (1.18) | (9.21) | (0.65) |
| COCA COLA | 0.13 | -0.01 | 0.14 | -0.20 | 0.06 | -0.08 | 0.97 | 1.00 |
| | (0.86) | (-0.06) | (1.09) | (-1.64) | (0.47) | (-1.24) | (5.10) | (0.75) |
| AT&T CORP. | 0.04 | -0.25 | 0.02 | -0.13 | -0.07 | 0.10 | 1.29 | 4.35 |
| | (0.26) | (-1.34) | (0.11) | (-0.99) | (-0.48) | (1.48) | (6.07) | (2.93) |
| IBM | 0.20 | 0.45 | 0.10 | 0.12 | -0.09 | -0.17 | 0.39 | 5.38 |
| | (0.83) | (1.77) | (0.52) | (0.67) | (-0.46) | (-1.81) | (1.35) | (2.64) |
| BRISTOL MYERS | 0.25 | -0.32 | -0.05 | -0.02 | 0.00 | 0.02 | 1.12 | 2.55 |
| | (1.72) | (-2.13) | (-0.44) | (-0.15) | (0.03) | (0.26) | (6.37) | (2.07) |
| JOHNSON & J. | -0.03 | -0.06 | -0.04 | -0.03 | 0.07 | -0.01 | 1.10 | 1.97 |
| | (-0.17) | (-0.29) | (-0.25) | (-0.24) | (0.44) | (-0.13) | (4.98) | (1.27) |
| DU PONT | -0.29 | 0.32 | 0.02 | 0.10 | -0.06 | 0.04 | 0.87 | 5.57 |
| | (-1.78) | (1.87) | (0.18) | (0.81) | (-0.44) | (0.59) | (4.44) | (4.06) |
| GTE | 0.34 | -0.56 | 0.15 | -0.09 | -0.11 | 0.02 | 1.26 | 1.96 |
| | (2.34) | (-3.66) | (1.27) | (-0.84) | (-0.86) | (0.29) | (7.10) | (1.59) |
| ABBOTT LABS. | 0.24 | -0.17 | -0.21 | -0.05 | 0.16 | 0.06 | 0.98 | 3.41 |
| | (1.33) | (-0.88) | (-1.45) | (-0.37) | (1.05) | (0.77) | (4.44) | (2.22) |
| AMER.HOME PRDS. | 0.37 | -0.26 | -0.11 | 0.04 | -0.01 | 0.06 | 0.91 | 2.57 |
| | (2.55) | (-1.72) | (-0.91) | (0.37) | (-0.06) | (0.97) | (5.13) | (2.07) |
| LILLY ELI | -0.02 | 0.03 | -0.34 | 0.02 | 0.12 | -0.07 | 1.26 | 4.34 |
| | (-0.08) | (0.14) | (-2.13) | (0.15) | (0.68) | (-0.92) | (5.21) | (2.56) |
| AMOCO | 0.67 | -0.17 | -0.03 | 0.19 | -0.23 | 0.07 | 0.49 | 5.52 |
| | (5.06) | (-1.20) | (-0.27) | (1.88) | (-1.98) | (1.22) | (3.06) | (4.88) |
| CHEVRON | 0.47 | 0.01 | -0.11 | 0.05 | -0.05 | 0.15 | 0.50 | 3.63 |
| | (3.02) | (0.05) | (-0.91) | (0.39) | (-0.37) | (2.35) | (2.63) | (2.73) |
| AMER.INTL.GP. | -0.13 | -0.20 | -0.04 | -0.21 | 0.01 | 0.11 | 1.47 | -0.78 |
| | (-0.84) | (-1.27) | (-0.33) | (-1.79) | (0.06) | (1.74) | (7.92) | (-0.60) |
| FEDERAL NAT. | -0.62 | -0.18 | 0.23 | -0.34 | -0.23 | 0.08 | 2.08 | -0.89 |
| | (-2.60) | (-0.73) | (1.22) | (-1.85) | (-1.13) | (0.81) | (7.14) | (-0.44) |
| GENERAL MOTORS | -0.12 | 0.77 | 0.16 | 0.10 | -0.05 | 0.01 | 0.13 | 3.83 |
| | (-0.52) | (3.18) | (0.86) | (0.56) | (-0.28) | (0.14) | (0.47) | (1.94) |
| ANHEUSER-BUSCH | 0.03 | -0.21 | -0.18 | 0.01 | 0.12 | -0.09 | 1.32 | 1.20 |
| | (0.18) | (-1.30) | (-1.49) | (0.07) | (0.92) | (-1.51) | (7.16) | (0.93) |
| ATLANTIC RICH. | 0.61 | 0.10 | -0.05 | 0.18 | -0.20 | 0.12 | 0.26 | 4.43 |
| | (4.09) | (0.61) | (-0.45) | (1.53) | (-1.56) | (1.99) | (1.44) | (3.51) |

TABLE II (Cont.)

Results of the Regressions for US Assets

From January 1988 to July 1996

| ASSET | $\hat{\beta}_0$ | $\hat{\beta}_{CN}$ | $\hat{\beta}_{FR}$ | $\hat{\beta}_{UK}$ | $\hat{\beta}_{G}$ | $\hat{\beta}_{JA}$ | $\hat{\beta}_{US}$ | $\hat{\beta}_{S\&P}$ |
|---|---|---|---|---|---|---|---|---|
| BOEING | 0.06 | -0.18 | 0.04 | 0.07 | -0.06 | 0.03 | 1.05 | 0.22 |
| | (0.29) | (-0.78) | (0.22) | (0.39) | (-0.31) | (0.30) | (3.92) | (0.12) |
| KELLOGG | 0.49 | -0.01 | -0.16 | -0.08 | 0.01 | -0.11 | 0.86 | 4.78 |
| | (2.47) | (-0.05) | (-1.00) | (-0.52) | (0.05) | (-1.36) | (3.59) | (2.84) |
| KODAK | 0.15 | 0.17 | 0.02 | -0.18 | 0.24 | 0.00 | 0.60 | -0.26 |
| | (0.80) | (0.87) | (0.14) | (-1.24) | (1.52) | (0.01) | (2.63) | (-0.17) |
| DISNEY | -0.43 | 0.31 | 0.14 | -0.28 | 0.04 | -0.10 | 1.32 | -2.24 |
| | (-2.16) | (1.48) | (0.88) | (-1.79) | (0.26) | (-1.28) | (5.42) | (-1.32) |
| DOW CHEMICALS | -0.21 | 0.48 | 0.31 | -0.07 | -0.30 | -0.06 | 0.83 | 1.32 |
| | (-1.07) | (2.34) | (2.00) | (-0.43) | (-1.76) | (-0.79) | (3.50) | (0.79) |
| HEWLETT-PACKARD | -0.51 | 0.11 | 0.07 | 0.13 | -0.14 | -0.24 | 1.59 | -2.22 |
| | (-2.06) | (0.42) | (0.36) | (0.67) | (-0.68) | (-2.47) | (5.27) | (-1.05) |
| FORD MOTOR | -0.19 | 0.05 | 0.24 | 0.16 | -0.21 | -0.01 | 0.95 | -0.99 |
| | (-0.80) | (0.22) | (1.31) | (0.86) | (-1.06) | (-0.10) | (3.35) | (-0.50) |
| EMERSON ELECTRIC | -0.20 | -0.02 | 0.16 | -0.17 | -0.06 | -0.06 | 1.35 | 1.33 |
| | (-1.42) | (-0.13) | (1.42) | (-1.63) | (-0.50) | (-1.17) | (8.07) | (1.13) |
| GILLETTE | -0.14 | -0.15 | -0.28 | -0.10 | 0.23 | 0.05 | 1.39 | 2.15 |
| | (-0.62) | (-0.65) | (-1.61) | (-0.57) | (1.23) | (0.54) | (5.28) | (1.17) |
| GEN.MILLS | 0.12 | 0.09 | -0.28 | -0.07 | 0.24 | -0.08 | 0.98 | 1.78 |
| | (0.74) | (0.52) | (-2.16) | (-0.54) | (1.76) | (-1.30) | (5.05) | (1.31) |
| BAXTER INTL. | -0.16 | 0.26 | -0.37 | 0.12 | 0.23 | -0.03 | 0.94 | 2.77 |
| | (-0.83) | (1.35) | (-2.49) | (0.82) | (1.45) | (-0.45) | (4.16) | (1.75) |
| CAMPBELL SOUP | -0.13 | -0.08 | -0.12 | -0.09 | 0.24 | -0.10 | 1.29 | 2.51 |
| | (-0.60) | (-0.35) | (-0.70) | (-0.50) | (1.27) | (-1.07) | (4.75) | (1.32) |
| LIMITED | -0.50 | 0.33 | 0.16 | -0.31 | 0.02 | -0.10 | 1.38 | -4.16 |
| | (-1.56) | (0.99) | (0.65) | (-1.26) | (0.08) | (-0.75) | (3.57) | (-1.54) |
| BERKSHIRE HAT. | 0.12 | -0.29 | -0.06 | -0.09 | 0.05 | -0.01 | 1.30 | -2.11 |
| | (0.54) | (-1.30) | (-0.33) | (-0.56) | (0.25) | (-0.09) | (4.96) | (-1.16) |
| ARCHER-DANLS. | 0.00 | -0.14 | 0.21 | 0.16 | -0.33 | -0.02 | 1.12 | 3.13 |
| | (-0.02) | (-0.62) | (1.23) | (1.00) | (-1.82) | (-0.20) | (4.36) | (1.75) |
| DUN & BRADSTREET | 0.24 | 0.02 | -0.15 | -0.02 | 0.00 | -0.01 | 0.91 | -0.50 |
| | (1.43) | (0.12) | (-1.12) | (-0.14) | (0.02) | (-0.15) | (4.39) | (-0.35) |
| HEINZ & H.J. | 0.05 | 0.24 | -0.11 | -0.15 | 0.31 | -0.11 | 0.77 | 1.68 |
| | (0.26) | (1.33) | (-0.81) | (-1.09) | (2.09) | (-1.53) | (3.69) | (1.15) |
| INTEL | -0.56 | 0.38 | 0.21 | -0.43 | 0.04 | -0.22 | 1.60 | -7.20 |
| | (-1.67) | (1.08) | (0.78) | (-1.64) | (0.13) | (-1.65) | (3.90) | (-2.51) |
| T-BILL | 1.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.01 | 0.09 |
| | (176.35) | (-0.35) | (0.06) | (-0.01) | (0.16) | (-1.31) | (0.76) | (1.83) |

TABLE III

Results of the Regressions for Foreign Portfolios

From January 1977 to December 1981

| PORTFOLIO | $\hat{\beta}_0$ | $\hat{\beta}_{CN}$ | $\hat{\beta}_{FR}$ | $\hat{\beta}_{UK}$ | $\hat{\beta}_{G}$ | $\hat{\beta}_{JA}$ | $\hat{\beta}_{US}$ | $\hat{\beta}_{S\&P}$ |
|---|---|---|---|---|---|---|---|---|
| CN 1 | 0.00 | 0.36 | 0.04 | -0.18 | 0.12 | 0.12 | 0.53 | -2.46 |
| | (0.02) | (2.84) | (0.75) | (-2.11) | (1.03) | (1.15) | (3.36) | (-1.91) |
| CN 2 | -0.12 | 0.64 | -0.08 | -0.23 | 0.16 | 0.19 | 0.45 | -2.69 |
| | (-0.77) | (4.56) | (-1.31) | (-2.48) | (1.30) | (1.68) | (2.61) | (-1.92) |
| CN 3 | -0.12 | 0.95 | 0.08 | 0.01 | 0.03 | 0.00 | 0.06 | -0.53 |
| | (-0.95) | (8.39) | (1.54) | (0.14) | (0.32) | (-0.04) | (0.41) | (-0.47) |
| CN 4 | 0.23 | 1.28 | 0.01 | 0.17 | 0.02 | -0.13 | -0.56 | -2.32 |
| | (0.99) | (6.08) | (0.06) | (1.25) | (0.09) | (-0.75) | (-2.16) | (-1.10) |
| CN 5 | 0.17 | 1.61 | 0.01 | 0.04 | -0.18 | -0.18 | -0.46 | 2.59 |
| | (1.15) | (11.87) | (0.13) | (0.40) | (-1.52) | (-1.66) | (-2.74) | (1.91) |
| FR 1 | -0.31 | 0.06 | 0.72 | -0.11 | 0.21 | 0.14 | 0.28 | -3.91 |
| | (-1.70) | (0.38) | (9.50) | (-1.06) | (1.46) | (1.05) | (1.39) | (-2.36) |
| FR 2 | -0.08 | 0.00 | 0.93 | 0.03 | 0.04 | 0.11 | -0.05 | -2.20 |
| | (-0.55) | (-0.04) | (16.31) | (0.40) | (0.38) | (1.13) | (-0.30) | (-1.76) |
| FR 3 | -0.33 | 0.04 | 1.06 | -0.02 | -0.43 | 0.28 | 0.40 | -3.42 |
| | (-0.74) | (0.11) | (5.79) | (-0.06) | (-1.22) | (0.88) | (0.81) | (-0.86) |
| FR 4 | 0.03 | 0.18 | 1.36 | 0.03 | -0.33 | -0.10 | -0.18 | 4.58 |
| | (0.12) | (0.72) | (11.49) | (0.18) | (-1.45) | (-0.46) | (-0.56) | (1.77) |
| FR 5 | -0.49 | 0.31 | 1.60 | -0.04 | 0.12 | 0.12 | -0.63 | -1.62 |
| | (-1.48) | (1.05) | (11.76) | (-0.22) | (0.44) | (0.51) | (-1.71) | (-0.54) |
| UK 1 | 0.17 | -0.56 | -0.44 | 0.48 | -0.05 | 0.35 | 1.05 | 4.47 |
| | (0.27) | (-0.97) | (-1.67) | (1.29) | (-0.09) | (0.75) | (1.49) | (0.78) |
| UK 2 | 0.17 | 0.18 | 0.01 | 0.59 | 0.11 | 0.03 | -0.08 | -1.19 |
| | (1.15) | (1.35) | (0.22) | (6.60) | (0.89) | (0.26) | (-0.47) | (-0.88) |
| UK 3 | 0.03 | 0.06 | -0.03 | 0.91 | 0.08 | 0.02 | -0.06 | -1.27 |
| | (0.45) | (0.83) | (-0.93) | (20.09) | (1.34) | (0.29) | (-0.73) | (-1.84) |
| UK 4 | -0.09 | 0.00 | 0.02 | 1.17 | -0.01 | -0.07 | -0.01 | -1.53 |
| | (-0.97) | (0.05) | (0.43) | (21.37) | (-0.20) | (-1.10) | (-0.07) | (-1.83) |
| UK 5 | -0.02 | 0.01 | -0.11 | 1.42 | -0.06 | 0.00 | -0.23 | 0.23 |
| | (-0.14) | (0.10) | (-1.60) | (14.43) | (-0.44) | (-0.02) | (-1.24) | (0.15) |
| UK 6 | 0.70 | -0.21 | -0.19 | 1.69 | -0.24 | 0.00 | -0.72 | 3.77 |
| | (1.27) | (-0.42) | (-0.84) | (5.13) | (-0.54) | (0.00) | (-1.16) | (0.75) |
| UK 7 | 0.21 | -0.52 | 0.06 | 1.79 | -0.14 | -0.57 | 0.20 | 17.07 |
| | (0.26) | (-0.72) | (0.17) | (3.79) | (-0.22) | (-0.98) | (0.22) | (2.37) |

TABLE III (Cont.)

Results of the Regressions for Foreign Portfolios

From January 1977 to December 1981

| PORTFOLIO | $\hat{\beta}_0$ | $\hat{\beta}_{CN}$ | $\hat{\beta}_{FR}$ | $\hat{\beta}_{UK}$ | $\hat{\beta}_G$ | $\hat{\beta}_{JA}$ | $\hat{\beta}_{US}$ | $\hat{\beta}_{S\&P}$ |
|---|---|---|---|---|---|---|---|---|
| DB 1 | 0.08 | 0.02 | 0.02 | 0.09 | 0.87 | 0.03 | -0.12 | 0.88 |
| | (0.70) | (0.21) | (0.36) | (1.31) | (9.00) | (0.35) | (-0.92) | (0.81) |
| DB 2 | -0.03 | 0.01 | -0.02 | 0.01 | 1.03 | -0.02 | 0.02 | -0.03 |
| | (-0.57) | (0.16) | (-0.70) | (0.47) | (25.07) | (-0.65) | (0.27) | (-0.08) |
| DB 3 | -0.02 | -0.03 | -0.04 | 0.01 | 1.13 | -0.03 | -0.03 | -0.81 |
| | (-0.28) | (-0.34) | (-1.07) | (0.26) | (16.68) | (-0.42) | (-0.32) | (-1.05) |
| DB 4 | -0.31 | 0.08 | -0.26 | 0.31 | 1.33 | -0.15 | 0.00 | -3.33 |
| | (-0.99) | (0.27) | (-2.02) | (1.66) | (5.30) | (-0.66) | (0.00) | (-1.17) |
| JP 1 | 0.78 | 0.05 | 0.29 | 0.02 | 0.08 | 0.10 | -0.32 | 2.13 |
| | (2.35) | (0.17) | (2.06) | (0.11) | (0.30) | (0.41) | (-0.86) | (0.70) |
| JP 2 | 0.24 | -0.09 | 0.03 | 0.01 | 0.12 | 0.68 | 0.02 | 0.06 |
| | (2.99) | (-1.27) | (0.86) | (0.19) | (1.84) | (11.61) | (0.24) | (0.09) |
| JP 3 | -0.19 | 0.05 | -0.01 | 0.04 | 0.03 | 1.10 | -0.02 | 0.39 |
| | (-2.15) | (0.59) | (-0.38) | (0.78) | (0.44) | (17.31) | (-0.21) | (0.50) |
| JP 4 | -0.40 | 0.22 | -0.10 | -0.14 | -0.05 | 1.52 | -0.04 | -0.31 |
| | (-2.20) | (1.32) | (-1.37) | (-1.28) | (-0.35) | (11.32) | (-0.20) | (-0.18) |
| JP 5 | -0.60 | 0.04 | -0.11 | -0.23 | -0.28 | 1.91 | 0.25 | -3.43 |
| | (-2.03) | (0.16) | (-0.87) | (-1.29) | (-1.17) | (8.86) | (0.77) | (-1.28) |
| JP 6 | -1.15 | -0.05 | -0.11 | -0.63 | -0.07 | 2.28 | 0.73 | 6.93 |
| | (-2.31) | (-0.12) | (-0.53) | (-2.12) | (-0.18) | (6.26) | (1.31) | (1.53) |

TABLE IV

Results of the Regressions for Foreign Portfolios

From January 1982 to December 1987

| PORTFOLIO | $\hat{\beta}_0$ | $\hat{\beta}_{CN}$ | $\hat{\beta}_{FR}$ | $\hat{\beta}_{UK}$ | $\hat{\beta}_G$ | $\hat{\beta}_{JA}$ | $\hat{\beta}_{US}$ | $\hat{\beta}_{S\&P}$ |
|---|---|---|---|---|---|---|---|---|
| CN 1 | 0.10 | 1.10 | -0.04 | -0.13 | 0.21 | 0.03 | -0.26 | -3.00 |
| | (0.99) | (8.27) | (-0.46) | (-1.26) | (2.66) | (0.34) | (-1.66) | (-2.67) |
| CN 2 | 0.17 | 0.85 | -0.15 | -0.16 | 0.08 | 0.06 | 0.15 | -2.25 |
| | (1.64) | (6.26) | (-1.63) | (-1.48) | (1.00) | (0.71) | (0.95) | (-1.95) |
| CN 3 | -0.04 | 0.79 | -0.11 | 0.02 | 0.08 | -0.07 | 0.33 | -0.01 |
| | (-0.59) | (7.92) | (-1.62) | (0.29) | (1.30) | (-1.16) | (2.85) | (-0.02) |
| CN 4 | 0.19 | 0.78 | -0.17 | 0.24 | -0.05 | 0.00 | 0.01 | 1.54 |
| | (0.88) | (2.76) | (-0.90) | (1.07) | (-0.29) | (0.03) | (0.03) | (0.64) |
| CN 5 | -0.13 | 1.36 | 0.15 | -0.03 | -0.17 | -0.02 | -0.15 | 2.87 |
| | (-1.15) | (8.70) | (1.42) | (-0.22) | (-1.85) | (-0.22) | (-0.84) | (2.16) |
| FR 1 | -0.26 | 0.12 | 0.98 | 0.00 | 0.08 | 0.09 | -0.02 | 0.02 |
| | (-2.57) | (0.85) | (10.73) | (0.03) | (1.03) | (1.12) | (-0.11) | (0.01) |
| FR 2 | 0.09 | -0.12 | 0.92 | 0.05 | 0.08 | 0.00 | -0.02 | -1.30 |
| | (1.43) | (-1.36) | (16.12) | (0.77) | (1.58) | (0.00) | (-0.18) | (-1.80) |
| FR 3 | -0.32 | 0.47 | 1.14 | -0.27 | 0.37 | 0.16 | -0.54 | -1.34 |
| | (-1.44) | (1.55) | (5.68) | (-1.14) | (2.08) | (0.87) | (-1.53) | (-0.53) |
| FR 4 | 0.17 | -0.15 | 1.71 | -0.17 | -0.44 | -0.45 | 0.33 | 9.38 |
| | (0.73) | (-0.47) | (8.01) | (-0.69) | (-2.32) | (-2.28) | (0.87) | (3.47) |
| FR 5 | -0.40 | -0.17 | 1.48 | 0.03 | 0.07 | 0.22 | -0.24 | 1.30 |
| | (-1.63) | (-0.53) | (6.79) | (0.12) | (0.34) | (1.12) | (-0.63) | (0.47) |
| UK 1 | -0.03 | 0.34 | 0.65 | 1.56 | -0.79 | -0.40 | -0.33 | 2.93 |
| | (-0.07) | (0.58) | (1.64) | (3.36) | (-2.24) | (-1.10) | (-0.48) | (0.58) |
| UK 2 | -0.02 | 0.23 | 0.08 | 1.07 | -0.01 | -0.04 | -0.31 | -0.96 |
| | (-0.18) | (1.45) | (0.79) | (8.47) | (-0.06) | (-0.40) | (-1.62) | (-0.70) |
| UK 3 | -0.03 | 0.00 | 0.04 | 0.97 | 0.04 | -0.03 | 0.01 | -0.78 |
| | (-0.59) | (0.03) | (0.98) | (19.12) | (1.08) | (-0.69) | (0.12) | (-1.43) |
| UK 4 | 0.13 | -0.08 | -0.02 | 1.06 | -0.03 | 0.00 | -0.03 | -0.12 |
| | (2.34) | (-1.18) | (-0.45) | (18.80) | (-0.82) | (-0.07) | (-0.41) | (-0.20) |
| UK 5 | -0.19 | -0.02 | 0.02 | 1.13 | 0.03 | 0.09 | -0.06 | -2.07 |
| | (-1.93) | (-0.12) | (0.26) | (11.17) | (0.35) | (1.08) | (-0.41) | (-1.89) |
| UK 6 | 0.05 | 0.21 | -0.28 | 0.88 | 0.37 | 0.31 | -0.53 | -1.58 |
| | (0.24) | (0.78) | (-1.52) | (4.07) | (2.28) | (1.80) | (-1.63) | (-0.68) |
| UK 7 | -0.34 | -0.22 | -0.09 | 1.09 | 0.16 | -0.35 | 0.74 | 9.59 |
| | (-0.83) | (-0.40) | (-0.25) | (2.55) | (0.48) | (-1.03) | (1.17) | (2.08) |

TABLE IV (Cont.)

RESULTS OF THE REGRESSIONS FOR FOREIGN PORTFOLIOS

FROM JANUARY 1982 TO DECEMBER 1987

| PORTFOLIO | $\hat{\beta}_0$ | $\hat{\beta}_{CN}$ | $\hat{\beta}_{FR}$ | $\hat{\beta}_{UK}$ | $\hat{\beta}_G$ | $\hat{\beta}_{JA}$ | $\hat{\beta}_{US}$ | $\hat{\beta}_{S\&P}$ |
|---|---|---|---|---|---|---|---|---|
| DB 1 | 0.14 | 0.20 | -0.04 | 0.38 | 0.71 | -0.02 | -0.36 | 0.12 |
| | (1.20) | (1.23) | (-0.36) | (3.04) | (7.46) | (-0.24) | (-1.94) | (0.09) |
| DB 2 | -0.01 | -0.03 | -0.01 | 0.06 | 1.01 | 0.01 | -0.03 | 0.16 |
| | (-0.30) | (-0.55) | (-0.25) | (1.29) | (28.46) | (0.30) | (-0.37) | (0.31) |
| DB 3 | -0.02 | -0.13 | 0.01 | -0.19 | 1.07 | 0.12 | 0.14 | 0.61 |
| | (-0.19) | (-1.20) | (0.12) | (-2.32) | (16.93) | (1.77) | (1.08) | (0.67) |
| DB 4 | -0.06 | -0.36 | 0.15 | -0.07 | 0.84 | 0.28 | 0.23 | -3.04 |
| | (-0.35) | (-1.57) | (0.96) | (-0.39) | (6.10) | (1.94) | (0.86) | (-1.54) |
| JP 1 | -0.33 | 0.03 | -0.42 | -0.48 | 0.42 | 1.59 | 0.18 | -2.40 |
| | (-1.57) | (0.11) | (-2.21) | (-2.16) | (2.50) | (9.04) | (0.54) | (-0.99) |
| JP 2 | 0.01 | -0.12 | 0.02 | 0.08 | -0.02 | 0.98 | 0.04 | -0.01 |
| | (0.18) | (-1.31) | (0.39) | (1.21) | (-0.39) | (17.94) | (0.39) | (-0.01) |
| JP 3 | 0.06 | 0.11 | -0.13 | 0.13 | 0.12 | 0.73 | -0.02 | -1.21 |
| | (0.56) | (0.79) | (-1.44) | (1.26) | (1.50) | (8.71) | (-0.14) | (-1.04) |
| JP 4 | -0.02 | 0.02 | -0.20 | 0.02 | 0.21 | 0.69 | 0.28 | -0.94 |
| | (-0.14) | (0.08) | (-1.61) | (0.17) | (1.87) | (6.02) | (1.26) | (-0.59) |
| JP 5 | -0.17 | 0.13 | -0.24 | 0.21 | 0.37 | 0.37 | 0.34 | 0.62 |
| | (-0.74) | (0.41) | (-1.18) | (0.85) | (2.05) | (1.96) | (0.94) | (0.24) |
| JP 6 | -0.30 | 0.12 | 0.09 | 0.37 | 0.41 | -0.03 | 0.35 | 2.47 |
| | (-0.91) | (0.27) | (0.30) | (1.06) | (1.54) | (-0.11) | (0.67) | (0.66) |

TABLE V

Results of the Regressions for Foreign Portfolios

From January 1988 to December 1992

| PORTFOLIO | $\hat{\beta}_0$ | $\hat{\beta}_{CN}$ | $\hat{\beta}_{FR}$ | $\hat{\beta}_{UK}$ | $\hat{\beta}_G$ | $\hat{\beta}_{JA}$ | $\hat{\beta}_{US}$ | $\hat{\beta}_{S\&P}$ |
|---|---|---|---|---|---|---|---|---|
| CN 1 | 0.11 | 0.57 | -0.05 | 0.00 | 0.03 | 0.02 | 0.32 | -0.52 |
| | (1.24) | (5.20) | (-0.63) | (0.04) | (0.30) | (0.54) | (2.71) | (-0.63) |
| CN 2 | -0.13 | 0.97 | -0.04 | -0.10 | 0.08 | 0.00 | 0.22 | 0.78 |
| | (-1.37) | (8.23) | (-0.45) | (-1.42) | (0.91) | (-0.08) | (1.78) | (0.89) |
| CN 3 | 0.15 | 1.14 | 0.02 | 0.08 | -0.09 | -0.04 | -0.26 | 1.18 |
| | (1.65) | (10.02) | (0.21) | (1.19) | (-1.05) | (-0.87) | (-2.16) | (1.39) |
| CN 4 | -0.55 | 1.69 | 0.17 | -0.02 | -0.16 | -0.24 | 0.11 | 2.14 |
| | (-2.70) | (6.81) | (0.95) | (-0.10) | (-0.85) | (-2.65) | (0.41) | (1.16) |
| FR 1 | 0.55 | -0.18 | 0.55 | 0.29 | 0.00 | -0.14 | -0.06 | 1.13 |
| | (3.68) | (-1.00) | (4.28) | (2.70) | (-0.01) | (-2.03) | (-0.33) | (0.83) |
| FR 2 | -0.16 | -0.01 | 0.84 | -0.10 | 0.18 | 0.05 | 0.19 | 1.42 |
| | (-1.48) | (-0.05) | (9.17) | (-1.31) | (1.84) | (1.11) | (1.37) | (1.47) |
| FR 3 | -0.25 | -0.09 | 1.09 | 0.15 | -0.13 | -0.11 | 0.34 | -0.46 |
| | (-1.75) | (-0.49) | (8.74) | (1.47) | (-0.99) | (-1.68) | (1.80) | (-0.35) |
| FR 4 | -0.18 | 0.16 | 1.36 | -0.13 | -0.30 | -0.02 | 0.09 | 1.71 |
| | (-0.93) | (0.66) | (8.06) | (-0.91) | (-1.62) | (-0.21) | (0.37) | (0.96) |
| FR 5 | -0.75 | 1.24 | 2.00 | -0.21 | -0.08 | 0.07 | -1.26 | -3.46 |
| | (-1.84) | (2.48) | (5.68) | (-0.71) | (-0.20) | (0.37) | (-2.39) | (-0.93) |
| UK 1 | 0.30 | -0.01 | 0.05 | 0.59 | 0.15 | 0.00 | -0.07 | -2.89 |
| | (2.13) | (-0.07) | (0.38) | (5.66) | (1.13) | (-0.05) | (-0.35) | (-2.21) |
| UK 2 | 0.01 | 0.08 | 0.03 | 0.92 | 0.01 | 0.01 | -0.05 | 0.19 |
| | (0.23) | (1.23) | (0.64) | (24.84) | (0.22) | (0.47) | (-0.74) | (0.40) |
| UK 3 | 0.02 | 0.08 | 0.05 | 1.20 | -0.13 | -0.03 | -0.19 | -0.69 |
| | (0.22) | (0.96) | (0.82) | (23.45) | (-1.91) | (-1.01) | (-2.06) | (-1.07) |
| UK 4 | -0.32 | 0.03 | 0.09 | 1.42 | -0.20 | 0.00 | -0.02 | 1.73 |
| | (-1.68) | (0.14) | (0.53) | (10.25) | (-1.13) | (0.02) | (-0.08) | (0.99) |
| UK 5 | -0.09 | -0.03 | -0.03 | 1.67 | -0.37 | 0.03 | -0.18 | 0.78 |
| | (-0.35) | (-0.10) | (-0.12) | (8.94) | (-1.54) | (0.24) | (-0.54) | (0.33) |
| DB 1 | 0.21 | 0.27 | 0.66 | 0.01 | 0.35 | -0.09 | -0.43 | 3.38 |
| | (0.62) | (0.64) | (2.23) | (0.04) | (1.09) | (-0.55) | (-0.96) | (1.08) |
| DB 2 | 0.30 | -0.01 | 0.26 | 0.15 | 0.49 | -0.13 | -0.08 | -0.69 |
| | (1.78) | (-0.04) | (1.81) | (1.21) | (3.09) | (-1.64) | (-0.35) | (-0.45) |
| DB 3 | 0.03 | 0.12 | 0.05 | 0.03 | 0.78 | 0.02 | -0.03 | -1.11 |
| | (0.28) | (1.02) | (0.59) | (0.50) | (8.83) | (0.51) | (-0.26) | (-1.29) |
| DB 4 | 0.01 | -0.01 | -0.16 | 0.14 | 0.97 | 0.01 | 0.04 | -1.24 |
| | (0.05) | (-0.04) | (-1.46) | (1.55) | (8.36) | (0.14) | (0.23) | (-1.10) |
| DB 5 | -0.17 | -0.20 | 0.10 | 0.03 | 1.17 | -0.05 | 0.12 | -1.01 |
| | (-1.46) | (-1.40) | (1.02) | (0.41) | (10.85) | (-1.05) | (0.79) | (-0.97) |
| DB 6 | -0.19 | -0.17 | -0.07 | -0.12 | 1.36 | 0.01 | 0.18 | 2.25 |
| | (-1.27) | (-0.97) | (-0.53) | (-1.16) | (9.88) | (0.10) | (0.92) | (1.69) |

TABLE V (Cont.)

RESULTS OF THE REGRESSIONS FOR FOREIGN PORTFOLIOS

FROM JANUARY 1988 TO DECEMBER 1992

| PORTFOLIO | $\hat{\beta}_0$ | $\hat{\beta}_{CN}$ | $\hat{\beta}_{FR}$ | $\hat{\beta}_{UK}$ | $\hat{\beta}_G$ | $\hat{\beta}_{JA}$ | $\hat{\beta}_{US}$ | $\hat{\beta}_{S\&P}$ |
|---|---|---|---|---|---|---|---|---|
| JP1 | 0.32 | -0.14 | 0.08 | 0.15 | -0.10 | 0.63 | 0.06 | 1.11 |
| | (2.14) | (-0.77) | (0.63) | (1.39) | (-0.69) | (9.14) | (0.30) | (0.81) |
| JP2 | 0.00 | 0.05 | 0.22 | 0.07 | -0.29 | 1.01 | -0.05 | -0.47 |
| | (-0.01) | (0.49) | (3.22) | (1.19) | (-3.92) | (28.17) | (-0.48) | (-0.65) |
| JP 3 | -0.14 | 0.14 | 0.08 | 0.02 | -0.26 | 1.27 | -0.11 | 2.76 |
| | (-1.13) | (0.93) | (0.76) | (0.22) | (-2.18) | (22.33) | (-0.66) | (2.42) |
| JP 4 | -0.22 | -0.11 | -0.18 | 0.09 | -0.12 | 1.47 | 0.07 | -0.66 |
| | (-0.89) | (-0.37) | (-0.83) | (0.53) | (-0.53) | (13.16) | (0.23) | (-0.29) |
| JP 5 | -0.01 | -0.64 | -0.04 | -0.21 | -0.13 | 1.76 | 0.28 | 1.94 |
| | (-0.05) | (-2.30) | (-0.22) | (-1.27) | (-0.58) | (17.07) | (0.95) | (0.93) |

TABLE VI

Results of the Regressions for Foreign Portfolios

From January 1993 to July 1996

| PORTFOLIO | $\hat{\beta}_0$ | $\hat{\beta}_{CN}$ | $\hat{\beta}_{FR}$ | $\hat{\beta}_{UK}$ | $\hat{\beta}_G$ | $\hat{\beta}_{JA}$ | $\hat{\beta}_{US}$ | $\hat{\beta}_{S\&P}$ |
|---|---|---|---|---|---|---|---|---|
| CN 1 | -0.25 | 0.82 | -0.06 | -0.05 | 0.14 | 0.00 | 0.41 | 1.74 |
| | (-1.68) | (6.12) | (-0.55) | (-0.31) | (1.35) | (-0.06) | (2.25) | (1.66) |
| CN 2 | -0.11 | 0.48 | 0.09 | 0.18 | -0.10 | 0.12 | 0.34 | 0.53 |
| | (-0.77) | (3.62) | (0.80) | (1.00) | (-0.92) | (2.64) | (1.87) | (0.51) |
| CN 3 | 0.00 | 1.20 | -0.10 | 0.06 | -0.03 | 0.11 | -0.24 | 1.05 |
| | (-0.01) | (8.27) | (-0.83) | (0.32) | (-0.27) | (2.31) | (-1.20) | (0.92) |
| CN 4 | 0.22 | 1.36 | -0.43 | 1.16 | 0.00 | -0.16 | -1.14 | 1.75 |
| | (0.79) | (5.39) | (-2.05) | (3.45) | (-0.02) | (-1.91) | (-3.33) | (0.88) |
| FR 1 | 0.04 | -0.28 | 0.72 | 0.25 | 0.06 | 0.04 | 0.16 | 2.92 |
| | (0.22) | (-1.69) | (5.19) | (1.14) | (0.48) | (0.72) | (0.72) | (2.23) |
| FR 2 | 0.14 | 0.04 | 0.96 | 0.04 | 0.01 | 0.00 | -0.19 | 0.36 |
| | (0.69) | (0.20) | (6.30) | (0.17) | (0.10) | (0.07) | (-0.75) | (0.25) |
| FR 3 | 0.20 | -0.14 | 0.99 | 0.17 | 0.06 | -0.04 | -0.25 | 2.28 |
| | (0.89) | (-0.65) | (5.77) | (0.64) | (0.35) | (-0.59) | (-0.90) | (1.40) |
| FR 4 | 0.09 | 0.99 | 0.89 | -1.45 | 0.72 | 0.08 | -0.31 | -4.21 |
| | (0.12) | (1.48) | (1.60) | (-1.63) | (1.37) | (0.37) | (-0.34) | (-0.80) |
| FR 5 | 0.45 | 0.60 | 1.10 | -0.32 | -0.17 | -0.21 | -0.42 | -5.77 |
| | (1.05) | (1.52) | (3.36) | (-0.61) | (-0.54) | (-1.64) | (-0.80) | (-1.87) |
| UK 1 | 0.12 | 0.03 | 0.13 | 1.04 | -0.04 | -0.11 | -0.16 | 1.56 |
| | (0.68) | (0.15) | (0.93) | (4.76) | (-0.32) | (-2.02) | (-0.71) | (1.21) |
| UK 2 | 0.09 | 0.09 | 0.11 | 0.74 | 0.00 | 0.00 | -0.03 | -0.28 |
| | (0.80) | (0.90) | (1.36) | (5.49) | (0.01) | (0.03) | (-0.24) | (-0.35) |
| UK 3 | 0.17 | 0.31 | 0.24 | 0.64 | -0.06 | 0.01 | -0.31 | -0.19 |
| | (1.53) | (3.12) | (2.86) | (4.77) | (-0.80) | (0.29) | (-2.24) | (-0.24) |
| UK 4 | -0.28 | 0.46 | 0.18 | 0.30 | 0.07 | 0.31 | -0.01 | -4.80 |
| | (-1.12) | (2.00) | (0.92) | (0.99) | (0.39) | (4.05) | (-0.04) | (-2.68) |
| UK 5 | -0.31 | -0.09 | -0.40 | 1.14 | 0.14 | 0.06 | 0.47 | -2.61 |
| | (-0.96) | (-0.32) | (-1.65) | (2.94) | (0.61) | (0.61) | (1.18) | (-1.14) |
| DB 1 | 0.16 | 0.77 | 0.55 | -1.19 | 1.15 | -0.10 | -0.34 | -4.90 |
| | (0.45) | (2.36) | (2.02) | (-2.74) | (4.50) | (-0.91) | (-0.77) | (-1.91) |
| DB 2 | 0.08 | -0.26 | 0.01 | 0.12 | 0.94 | 0.09 | 0.03 | -0.78 |
| | (0.36) | (-1.25) | (0.03) | (0.44) | (5.71) | (1.37) | (0.10) | (-0.47) |
| DB 3 | 0.22 | 0.06 | 0.04 | -0.04 | 0.97 | -0.05 | -0.20 | -1.20 |
| | (1.85) | (0.58) | (0.40) | (-0.30) | (11.29) | (-1.30) | (-1.34) | (-1.39) |
| DB 4 | 0.05 | -0.11 | 0.20 | 0.28 | 0.79 | -0.15 | -0.07 | 0.33 |
| | (0.32) | (-0.79) | (1.80) | (1.56) | (7.41) | (-3.26) | (-0.40) | (0.30) |
| DB 5 | -0.15 | 0.12 | -0.06 | -0.06 | 1.16 | -0.04 | 0.03 | -0.14 |
| | (-1.17) | (1.06) | (-0.64) | (-0.36) | (12.67) | (-1.04) | (0.17) | (-0.15) |
| DB 6 | -0.14 | -0.04 | -0.33 | 0.26 | 1.33 | 0.01 | -0.09 | -2.63 |
| | (-0.68) | (-0.21) | (-2.15) | (1.03) | (9.09) | (0.24) | (-0.35) | (-1.79) |

TABLE VI (Cont.)
RESULTS OF THE REGRESSIONS FOR FOREIGN PORTFOLIOS
FROM JANUARY 1993 TO JULY 1996

| PORTFOLIO | $\hat{\beta}_0$ | $\hat{\beta}_{CN}$ | $\hat{\beta}_{FR}$ | $\hat{\beta}_{UK}$ | $\hat{\beta}_G$ | $\hat{\beta}_{JA}$ | $\hat{\beta}_{US}$ | $\hat{\beta}_{S\&P}$ |
|---|---|---|---|---|---|---|---|---|
| JA 1 | 0.32 | 0.14 | -0.11 | -0.12 | 0.22 | 0.98 | -0.42 | -1.28 |
| | (1.68) | (0.81) | (-0.77) | (-0.54) | (1.64) | (17.32) | (-1.80) | (-0.95) |
| JA 2 | 0.07 | 0.06 | -0.05 | -0.07 | 0.11 | 1.02 | -0.14 | 1.20 |
| | (0.63) | (0.59) | (-0.61) | (-0.52) | (1.30) | (29.50) | (-0.95) | (1.45) |
| JA 3 | -0.15 | -0.15 | -0.06 | 0.08 | -0.04 | 1.16 | 0.16 | -0.62 |
| | (-0.98) | (-1.09) | (-0.51) | (0.44) | (-0.37) | (25.33) | (0.86) | (-0.56) |
| JA 4 | -0.56 | 0.10 | -0.02 | 0.09 | -0.10 | 1.35 | 0.14 | 1.43 |
| | (-1.86) | (0.35) | (-0.07) | (0.24) | (-0.49) | (15.06) | (0.38) | (0.67) |
| JA 5 | -0.44 | -0.25 | -0.14 | 0.08 | 0.08 | 1.35 | 0.32 | 0.23 |
| | (-1.65) | (-1.03) | (-0.70) | (0.25) | (0.43) | (17.06) | (0.98) | (0.12) |

TABLE VII

Results of the Regressions for US Portfolios

| PORTFOLIO | $\hat{\beta}_0$ | $\hat{\beta}_{CN}$ | $\hat{\beta}_{FR}$ | $\hat{\beta}_{UK}$ | $\hat{\beta}_G$ | $\hat{\beta}_{JA}$ | $\hat{\beta}_{US}$ | $\hat{\beta}_{S\&P}$ |
|---|---|---|---|---|---|---|---|---|
| | | | From January 1977 to December 1981 | | | | | |
| US 1 | 0.12 | 0.04 | -0.01 | -0.03 | 0.02 | 0.01 | 0.85 | -1.04 |
| | (2.65) | (0.93) | (-0.54) | (-1.20) | (0.67) | (0.41) | (16.69) | (-2.53) |
| US 2 | -0.02 | -0.32 | -0.01 | -0.04 | -0.17 | 0.09 | 1.48 | -3.64 |
| | (-0.19) | (-2.74) | (-0.16) | (-0.56) | (-1.65) | (1.00) | (10.20) | (-3.10) |
| US 3 | -0.54 | -0.08 | -0.05 | -0.34 | 0.10 | 0.09 | 1.84 | -3.71 |
| | (-2.07) | (-0.34) | (-0.50) | (-2.16) | (0.47) | (0.48) | (6.21) | (-1.55) |
| US 4 | -1.92 | 0.04 | -0.42 | 0.07 | 0.47 | -0.02 | 2.79 | -4.80 |
| | (-3.15) | (0.07) | (-1.67) | (0.20) | (0.96) | (-0.04) | (4.07) | (-0.87) |
| | | | From January 1982 to December 1987 | | | | | |
| US 1 | 0.07 | -0.09 | -0.02 | 0.02 | 0.03 | -0.01 | 1.01 | 0.83 |
| | (2.44) | (-2.29) | (-0.72) | (0.51) | (1.24) | (-0.57) | (21.22) | (2.39) |
| US 2 | 0.07 | -0.12 | 0.03 | 0.04 | -0.07 | 0.00 | 1.06 | -1.42 |
| | (0.99) | (-1.31) | (0.44) | (0.59) | (-1.26) | (-0.08) | (9.64) | (-1.78) |
| US 3 | -0.28 | 0.12 | 0.00 | -0.19 | 0.00 | 0.05 | 1.30 | -1.22 |
| | (-2.12) | (0.70) | (-0.03) | (-1.42) | (0.02) | (0.51) | (6.36) | (-0.82) |
| US 4 | -1.10 | 0.74 | -0.19 | -0.07 | 0.16 | 0.03 | 1.45 | -4.80 |
| | (-4.27) | (2.16) | (-0.83) | (-0.26) | (0.80) | (0.13) | (3.59) | (-1.65) |
| | | | From January 1988 to December 1992 | | | | | |
| US 1 | 0.43 | 0.22 | 0.04 | 0.14 | -0.15 | 0.02 | 0.30 | 3.80 |
| | (5.08) | (2.12) | (0.50) | (2.33) | (-1.92) | (0.45) | (2.76) | (4.88) |
| US 2 | -0.10 | 0.27 | 0.00 | -0.04 | 0.05 | -0.02 | 0.84 | 0.78 |
| | (-1.00) | (2.34) | (-0.02) | (-0.55) | (0.58) | (-0.54) | (6.78) | (0.89) |
| US 3 | -0.01 | -0.15 | -0.02 | -0.08 | 0.05 | -0.04 | 1.25 | 0.91 |
| | (-0.11) | (-2.55) | (-0.50) | (-2.24) | (1.04) | (-1.74) | (19.68) | (2.03) |
| US 4 | -0.48 | -0.03 | -0.15 | -0.20 | 0.25 | 0.00 | 1.60 | -1.57 |
| | (-4.54) | (-0.27) | (-1.61) | (-2.59) | (2.53) | (0.03) | (11.74) | (-1.63) |
| US 5 | -0.67 | -0.05 | 0.23 | -0.29 | -0.29 | 0.06 | 2.03 | -3.54 |
| | (-2.06) | (-0.12) | (0.80) | (-1.24) | (-0.96) | (0.43) | (4.82) | (-1.19) |
| | | | From January 1993 to July 1996 | | | | | |
| US 1 | 0.12 | 0.26 | 0.14 | -0.30 | 0.05 | 0.06 | 0.68 | 2.64 |
| | (0.74) | (1.78) | (1.14) | (-1.57) | (0.41) | (1.28) | (3.46) | (2.31) |
| US 2 | -0.03 | -0.01 | -0.08 | 0.00 | 0.09 | -0.05 | 1.08 | 4.06 |
| | (-0.18) | (-0.05) | (-0.72) | (-0.01) | (0.79) | (-1.02) | (5.61) | (3.63) |
| US 3 | 0.23 | -0.01 | -0.09 | 0.12 | -0.05 | -0.03 | 0.84 | 2.37 |
| | (2.22) | (-0.11) | (-1.16) | (0.98) | (-0.71) | (-1.07) | (6.72) | (3.26) |
| US 4 | 0.09 | -0.05 | 0.18 | -0.04 | -0.23 | -0.06 | 1.12 | 1.04 |
| | (0.49) | (-0.29) | (1.30) | (-0.18) | (-1.82) | (-1.15) | (5.03) | (0.80) |
| US 5 | -0.48 | -0.30 | 0.28 | -0.29 | -0.11 | 0.16 | 1.73 | 5.29 |
| | (-1.40) | (-0.97) | (1.11) | (-0.72) | (-0.44) | (1.61) | (4.15) | (2.20) |