

Home Bias in Equity Portfolios: Theory and Evidence for Developed Markets

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Abstract

Equity home bias is one of the most important puzzles in international finance. This paper tries to measure the home bias equity based on Warnock (2002). We find strong evidence for the phenomena in nine developed financial markets during 1969-2003. We then test the International Capital Asset Pricing Model (ICAPM) of Adler and Dumas (1983) in order to explain the home bias by inflation hedging. We also test ICAPM of Coën (2001) which includes inflation and human capital. Our findings suggest that these two models are rejected. The lack of international diversification in equity portfolios is still a puzzle in international finance.

Keywords: international portfolio diversification, home bias equity, global financial markets, financial integration

1. Introduction

At the national level, the portfolio theory of Markowitz (1959) showed that the inclusion of slightly correlated assets in a portfolio reduces significantly the risk. At the international level, the benefits of international diversification were highlighted since pioneer works of Grubel (1968), Levy and Sarnat (1970), Solnik (1974), etc. These benefits are allotted to weak correlation between financial markets.

With the financial globalisation, one would expect that investors diversify internationally their portfolios and take advantage of international diversification. However, investors present a strong preference for national assets. This behavior called home bias is not the fact of hazard, but has several explanations in the financial literature. The most common causes are asymmetric information, inflation risk, non traded assets, transaction costs and segmentation of financial markets.

In this paper, we will try in the first step, to measure the home bias in investor portfolios of nine developed countries during the period 1969-2003. In the second step, we use the model of Adler and Dumas (1983), to test whether the hedging inflation could explain the home bias. In the third step, we test the International CAPM developed by Coën (2001), to check if human capital risk generates the observed home bias.

2. Literature Review

The empirical studies on international portfolio diversification stipulate that the majority of equities are held by domestic investors. French and Poterba (1991) showed that the proportions of domestic equities in the five larger financial markets were respectively of 92.2% for United States, 95.7% for Japan, 92% for United Kingdom, 79% for Germany and 89.4% for France.

Lewis (1998) is based on a mean-variance model to explain the relation between averages and variances in international financial markets. Using a world represented by two markets, the US market and index EAFE (Note 1), the optimal portfolio indicates that, for a low level of risk aversion, American investor should choose a portfolio with 39.75% of foreign securities. This weighting would pass to 39.45% for higher levels of risk aversion. These results suggest the presence of a strong home bias for any level of risk tolerance.

Harvey (1993) examined the returns of 20 emerging markets and showed that the standard models based on integrated capital markets don't explain the equity returns in these countries; He concluded that models based on market segmentation are more suitable than models based on market integration.

Cooper and Kaplanis (1994) proposed a model of international portfolio choice which integrates the deviations from Purchasing Power Parity and deadweight costs. They showed that the barriers to international investment don't constitute a crucial factor limiting the attraction of international diversification.

Vassalou (2000) tested the models of Grauer, Litzenberger and Stehle (1976), Solnik (1974) – Sercu (1980) and Adler and Dumas (1983), He reported that, the home bias cannot be caused by the desire of investors to hedge against price uncertainty.

Kang and Stulz (1997) investigated stock ownership in Japanese firms by non Japanese investors from January 1975 to December 1991, they documented that the preference of domestic stocks results from an information asymmetry between domestic and foreign investors.

Choe, Kho and Stulz (2001) examined the question of whether domestic investors have better information than foreign investors. Using Korean data from December 1996 to November 1998, the authors found a difference in the performance of domestic and foreign investors.

Bellalah and Aboura (2006) proposed a capital asset pricing model in presence of asymmetry information and transaction costs. The test results over the period 1991-2000, showed that the information costs were negatively correlated with the expected return.

Barron and Ni (2008) studied the impact of asymmetric information on equity home bias in international finance. By developing a rational anticipation model where information acquisition is endogenous, the authors found a relation between the portfolio size, the information cost and the degree of home bias in each country.

Amadi and Bergin (2008) constructed a portfolio allocation model with various configurations of the trading costs. They showed that turnover rates tend to be higher among foreign compared to domestic holdings. In the same way, they demonstrated that the presence of agents that confront different trading cost produced a notable home bias.

Mondria and Wu (2010) developed a model where investors face an information constraint and have a local informational advantage. The results indicate that the home bias remains important in the long run because of the interaction between information and portfolio choices. The empirical tests support the principal predictions of the model that bias increases with information capacity and decreases with financial integration.

Baxter and Jermann (1997) analyzed the empirical implications of non traded assets on portfolio choice for an US investor investing in four countries during the period 1970 -1991; they found that the home bias worsens with human capital risk.

Coën (2001) developed an International CAPM with human capital and deadweight costs. The empirical tests suggested that the non traded assets don't give an explication to the home bias puzzle.

3. Theoretical Models

3.1 The Model of Adler and Dumas (1983): The Inflation Hedging

To explain the home bias puzzle by the motive of inflation hedging, we use the model of Adler and Dumas (1983), which supposes that in a world of $L+1$ countries (and currencies) and N risky assets, the nominal returns R_i , measured in terms of $(L+1)$ th currency (Note 2), follow a stationary process of Itô :

$$R_i = \mu_i dt + \sigma_i dz_i, \quad i : 1, \dots, N \quad (1)$$

Where;

μ_i : The instantaneous expected nominal return of security i ;

σ_i : The instantaneous risk of security i ;

dz_i : The increment to a standard Gauss Wiener process.

The model also supposes that there are $L+1$ investor types, the inflation rate of an investor expressed in currency l follows a stationary process:

$$p^l = \pi^l dt + \sigma_\pi^l dz_\pi^l, \quad l : 1, \dots, L+1 \quad (2)$$

Where;

π^l : The expected instantaneous inflation rate of an investor l ;

σ_π^l : The standard deviation of instantaneous inflation rate;

dz_π^l : The increment to a standard Gauss Wiener process.

Basing on these two assumptions, Adler and Dumas (1983) showed that each investor in the world holds a portfolio composed of two funds: the first is a common portfolio to all investors and the second is a portfolio of hedging against inflation. The vector of the proportions invested in each risky security is:

$$x^l = \alpha^l \Omega^{-1}(\mu - r\mathbf{1}) + (1 - \alpha^l) \Omega^{-1} \omega^l \quad (3)$$

Where;

x^l : (N×1) vector of the proportions invested in each risky security for investor;

α^l : Risk tolerance of investor l (the reverse of risk aversion);

Ω : (N×N) instantaneous covariance matrix of nominal returns on various assets;

r : The instantaneous rate of return of riskless asset;

ω^l : (N×1) Vector of covariances of N risky asset returns with investor l 's inflation rate ;

$\mathbf{1}$: (N×1) vector of ones.

To estimate the equation (3), we will follow the methodology of Cooper and Kaplanis (1994), we thus suppose that the risk tolerance is identical for all investors, $\alpha^l = \alpha$ expected returns can be eliminated with the aggregation condition:

$$\sum_l x^l v^l = e \quad (4)$$

Where;

v^l : The proportion of the country l 's wealth in the world wealth for $L+1$ country;

e : a vector whose l th component represents the proportion of country l 's market capitalization in the worldwide market, for $l = 1, \dots, L+1$ ($e^l = 0$ for $l > L+1$).

Using relations (3) and (4), we can write (Note 3):

$$(x^l - e)/(1 - \alpha) = \Omega^{-1} \left[\omega^l - \sum_l x^l \omega^l \right] \quad (5)$$

This equation indicates that the deviations of investor portfolio from the worldwide portfolio are proportional to a vector of regression coefficients. Cooper and Kaplanis (1994) suggest that the multiple regression of the variable $(p^l - \sum_l y^l p^l)$, measuring the deviations of investor inflation rate from world inflation on the vector of nominal asset returns, present coefficients equal to the equation (5).

3.2 The Model of Coën (2001): Introduction of Human Capital

The objective is to test if the introduction of human capital into an International CAPM, explains domestic bias. For that, we will base our analysis on the model of Coën (2001) which takes into account the existence of human capital. To derive his model, the author introduced the assumption that human capital return (wages) of the investor follows a stationary process:

$$\frac{dH^l}{H^l} = \mu_h^l dt + \sigma_h^l dz_h^l \quad (6)$$

Where;

H^l : The wage value of investor l ;

μ_h^l : The instantaneous expected rate of variation of the wage;

σ_h^l : The standard deviation of the instantaneous rate of the wage;

z_h^l : A standard Wiener Process;

dz_h^l : A white noise.

The author also supposes that the total income of each investor comes from financial resources and human capital with respective proportions $(1 - \phi)$ and ϕ . Using the principle of Bellman to solve this problem, Coën (2001) derives the relation of the optimal portfolio:

$$x = \frac{\alpha}{(1-\phi)} \left[\frac{\Omega^{-1}(\mu - r\mathbf{1})}{1 - \mathbf{1}'\Omega^{-1}(\mu - r\mathbf{1})} \right] + \frac{(1-\alpha)}{(1-\phi)} \left[\frac{\Omega^{-1}\omega}{1 - \mathbf{1}'\Omega^{-1}\omega} \right] - \frac{\phi}{(1-\phi)} \left[\frac{\Omega^{-1}\kappa}{1 - \mathbf{1}'\Omega^{-1}\kappa} \right] \quad (7)$$

Where;

κ : (N×1) Vector of covariances $\sigma_{i,h}^l$ of N risky asset returns with investor's rate of change of the wage.

Thus, the optimal portfolio of individual investor becomes a combination of three funds:

- The logarithmic portfolio which is common for all investors;
- The personalized hedge portfolio which constitutes the best hedging against inflation for the investor l ;
- The personalized hedge portfolio personalized which constitutes the best hedging against the variation of the wage.

Using a method identical to that presented in the preceding section, we obtain the following relation:

$$(x^l - e) = \frac{(1-\alpha)}{(1-\phi)} \Omega^{-1} \left[\omega^l - \sum_l y^l \omega^l \right] - \frac{\phi}{(1-\phi)} \Omega^{-1} \left[\kappa^l - \sum_l y^l \kappa^l \right] \quad (8)$$

This equation indicates that the deviations of investor's portfolio from the worldwide portfolio are proportional to two vectors of the coefficients of regression. This equation differs from the equation (5) where, the second term is related to wages.

4. Empirical Results

4.1 Data Description

The data base is consisted on the equity market returns, the consumption price indices and the labor income rates for Canada, France, Italy, Japan, Netherlands, Spain, Sweden, United Kingdom and United States. The stock market indices are provided by Morgan Stanley Capital International Perspective [MSCI].and expressed in American dollar (the L+1st currency).

Market capitalizations at December 31st, 2003 come from World Federation of Exchanges and MSCI. The data on domestic and foreign holdings of investors are extracted from Coordinated Portfolio Investment Survey published by International Monetary Fund [IMF].

The price indexes as well as the labor income rates (used as proxy of the human capital) are from the International Financial Statistics of IMF.

The data used are of monthly frequency for the period December 1969 to December 2003.

4.2 Measure of Equity Home Bias

Warnock (2002) proposed a measure of equity home bias so that the bias is equal to zero if the share of investor l 's portfolio in domestic securities is equal to the share of the country l in world portfolio. If it is equal to 1, the investors hold only domestic securities.

$$\text{Home bias} = 1 - \frac{\text{Share of foreign equities in investor's portfolio}}{\text{Share of foreign equities in world portfolio}} \quad (9)$$

We measure the investor portfolio by domestic market capitalization plus the value of equities held by domestic investors abroad minus the value of equities held by foreign investors in domestic country.

We consider that world market capitalization is the sum of market capitalizations of the 9 developed markets of our sample. Table 1 presents the components of the bias variable for the 9 countries:

Table 1. Home Bias Measures (at December 2003)

Country	Share of country l in world market capitalization	Share of domestic equities in investor l 's portfolio	Share of foreign equities in investor l 's portfolio	Home bias equity
Canada	0.043	0.744	0.256	0.733
France	0.036	0.480	0.620	0.461
Italy	0.030	0.580	0.420	0.568
Japan	0.144	0.899	0.101	0.882
Netherlands	0.021	0.243	0.757	0.227
Spain	0.035	0.874	0.226	0.870
Sweden	0.014	0.596	0.404	0.591
United Kingdom	0.120	0.676	0.424	0.632
United States	0.554	0.828	0.172	0.615
Total	1			

The results of table 1 show a strong preference by investors for domestic equities. The bias is positive and exceeds 0.5 for all the countries, except for the Netherlands and France. This phenomenon is very important for Canada, Japan and Spain.

4.3 Home Bias Test with Inflation Hedging

We run the regressions with coefficients corresponding to the right-hand side members of the equation (5):

$$(p^l - \sum v^l p^l)_t = b_{0l} + \sum_{i=1}^N b_{il} R_{it} + u_t^l \quad l = 1, \dots, L+1 \quad (10)$$

The l th coefficient of this regression is an estimate of the domestic bias divided by one minus the risk tolerance.

Therefore, $b_{il} = \frac{(x^l - e^l)}{(1 - \alpha)}$ can be rewritten as follows:

$$b_{il} = \frac{\gamma_l (x^l - e^l)}{(\gamma_l - 1)} \quad (11)$$

Where;

$$\gamma_l = \alpha_l^{-1}$$

We substitute for b_{il} in the equation (10) and we use the wealth of each country as a proxy of market capitalization, we obtain:

$$(p^l - \sum e^l p^l)_t = b_{0l} + \sum_{i \neq l}^N b_{il} R_{it} + \frac{\gamma_l (x^l - e^l)}{(\gamma_l - 1)} R_{it} + u_t^l \quad (12)$$

We estimate the coefficients of risk aversion by using the generalized moment method (GMM) of Hansen (1982), which corrects heteroscedasticity and serial correlation. In this case, we use the returns as instrumental variables. Before presenting the results of this regression, we expose some descriptive statistics for inflation deviations of different countries. This variable is the difference between inflation rate of a country l and the average of inflation rates of the 9 countries.

Table 2. Descriptive statistics of inflation deviations

Country	Mean	Standard Deviation	Autocorrelations					
			ρ_1	ρ_2	ρ_3	ρ_4	ρ_{12}	ρ_{24}
Canada	-0.00017	-0.00017	0.095	-0.047	0.005	0.102	0.334	0.280
France	0.00022	0.00012	0.357	0.217	0.233	0.179	0.290	0.191
Italy	0.00251	0.0018	0.441	0.334	0.269	0.251	0.328	0.385
Japan	-0.0013	-0.0017	0.148	-0.073	0.059	0.060	0.405	0.387
Netherlands	-0.00096	-0.00098	0.201	0.114	-0.110	0.095	0.549	0.389
Spain	0.00278	0.00181	0.263	0.098	0.009	0.106	0.322	0.276
Sweden	0.000621	0.00015	0.120	0.060	-0.018	-0.014	0.239	0.209
United Kingdom	0.0015	0.0007	0.235	0.113	0.055	0.047	0.447	0.334
United States	-0.00029	2.22E-05	0.218	0.035	0.188	0.108	0.509	0.417

It is deduced from the table 2 that inflation deviation is positive for Spain, France, Italy, the United Kingdom and Sweden. It is however more important for Spain and Italy where inflation is higher than the average of the countries. The coefficients of autocorrelation of first order are significantly different from zero for all the countries, which show the predictable character of the inflation rates. The results of estimate of the equation (12) are given in table 3.

Table 3. Test of home bias by the motive of inflation hedging

Country	γ_l	Standard Deviation of γ_l	$(x^l - e^l)$	Probability that $b_{ll} > 0$ and $\gamma_l > 0$
Canada	0.013618	0.010081	0.701	0.000
France	0.003347	0.003248	0.444	0.000
Italy	-0.009436	0.009192	0.556	0.000
Japan	-0.019982	0.014516	0.550	0.000
Netherlands	0.006670	0.007138	0.755	0.000
Spain	0.012607	0.009951	0.839	0.000
Sweden	-0.003352	0.006189	0.582	0.000
United States	-0.005853	0.018709	0.274	0.000
United Kingdom	0.003026	0.015344	0.222	0.000

The estimates of risk aversion coefficients are very weak. Concerning the hypothesis which corresponds to the hedging inflation, we require that $b_{ll} > 0$, which indicates that the return of domestic financial market is positively correlated with inflation rate and that $\gamma_l > 0$, meaning a positive risk aversion. For each country, we test the joint hypothesis that $b_{ll} > 0$ and $\gamma_l > 0$

Where;

x^l : The proportion of the portfolio invested in domestic financial;

e^l : The proportion of the country l in world market capitalization;

γ_l : The estimate of the relative risk aversion coefficient;

The autocorrelation and the heteroscedasticity of errors are corrected by the test of Newey and West (1987) with 12 lags corresponding to the periodicity of series. The last column of table 3 presents the probability that the domestic bias is caused by the hedging inflation risk. For all the countries, there is a null probability that the joint hypothesis is validated. Therefore, the hedging of risk inflation does not explain the puzzle of domestic bias.

4.4 Test of International CAPM with Human Capital

We will adopt the same approach as that used previously. We thus consider the following system:

$$(p^l - \sum e^l p^l)_t = b_{0l} + (1 - \phi) \left(\sum_{i \neq l}^N b_{il} R_{it} + b \frac{\gamma_l (x^l - e^l)}{(\gamma_l - 1)} R_{it} \right) + \phi \left(\frac{\gamma_l}{\gamma_l - 1} \right) (h^l - \sum \gamma^l h^l) + u_t^l \quad (13)$$

Where;

$$h^l = \frac{dH^l}{H^l}$$

Table 4. Test of home bias by the motive of inflation hedging and human capital

Country	γ_l	Standard Deviation of γ_l	$(x^l - e^l)$	Probability that $b_{ll} > 0$ and $\gamma_l > 0$
Canada	0.026455	0.019402	0.701	0.000
France	0.006292	0.006102	0.444	0.000
Italy	-0.044029	0.032741	0.550	0.000
Japan	0.015166	0.016130	0.755	0.000
Netherlands	0.005439	0.027514	0.222	0.000
Spain	0.024794	0.019281	0.839	0.000
Sweden	-0.006934	0.012849	0.582	0.000
United States	-0.010400	0.033398	0.274	0.000
United Kingdom	-0.016913	0.016584	0.556	0.000

The results show that for the 9 countries, b_{ll} and the coefficient of relative risk aversion, are not jointly significantly positive. There is a null probability that the joint hypothesis is true.

However, we note that the coefficients of relative risk aversion for Canada and Spain are significantly different from zero on the level of 5%. In spite of this result, we can conclude that the hedging of risk inflation and the hedging of changes in the wage can be rejected as an explanation of home bias puzzle. Our study is coherent with the preceding studies and in particular that of Baxter and German (1997).

5. Conclusion

The international financial literature showed that investors are under diversified in international securities. This behavior called home bias, presents several explanations in the financial literature.

In this paper, we choose to test the domestic bias by using the model of Adler and Dumas (1983) which takes into account the deviations from power parity.

We examined the hypothesis that the preference for national assets is caused by the inflation hedging, we thus tested the assumption that the stock exchange return of a country is positively correlated with its inflation rate and that the coefficient of risk aversion is strictly positive. By applying this model to nine developed countries, the results show that the hedging of domestic inflation doesn't explain the puzzle of home bias, for the period 1969-2003, which confirms the results of Cooper and Kaplanis (1994).

The recent studies underline the role of human capital in the portfolio choice, it is for this reason, we based on the study of Coën (2001), which constitutes an extension of Adler and Dumas (1983) in order to solve the puzzle of domestic bias by inflation hedging and human capital.

The model of Coën (2001) supposes that optimal portfolio is composed of three funds: the logarithmic portfolio, the inflation hedge portfolio and the hedge portfolio against change in labor income. A negative correlation between the return of human capital and the returns of national securities should increase the national bias.

The results of the test of International CAPM with human capital show that the hedging inflation risk and the changes of wages can't explain the puzzle of home bias. The presence of human capital is important in international portfolio choice however its contribution to the explanation of domestic bias is weak. It could thus be interesting to seek other explanations. Future research on domestic bias cannot ignore the role of transaction cost in country allocation decisions. Moreover, asymmetry of information between domestic and foreign investors is one of the important characteristics of financial markets and could contribute to explain the puzzle of home bias.

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Notes

Note 1. The US market represents the domestic market and index EAFE represents the foreign market.

Note 2. According to Adler and Dumas (1983), we also suppose that N+1 asset is nominally riskless and that N-L first assets constitute stock securities and the L last constitute bonds.

Note 3. Basing on equation (3), we can write:

$$e = \sum v^l \alpha_l \Omega^{-1} (\mu - r_l) + \sum v^l (1 - \alpha^l) \Omega^{-1} \omega^l$$

$$\begin{aligned}
 e &= \Omega^{-1} \sum v^l \alpha (\mu - r_l) + (1 - \alpha) \Omega^{-1} \sum v^l \omega^l \\
 x^l - e &= \Omega^{-1} \left[\alpha (\mu - r_l) - \sum \alpha (\mu - r_l) v^l \right] + (1 - \alpha) \Omega^{-1} \left[\omega^l - \sum v^l \omega^l \right] \\
 x^l - e &= \Omega^{-1} (\mu - r_l) \left[\alpha - \sum \alpha v^l \right] + (1 - \alpha) \Omega^{-1} \left[\omega^l - \sum v^l \omega^l \right] \\
 x^l - e &= \Omega^{-1} (\mu - r_l) \left[\alpha - \alpha \sum v^l \right] + (1 - \alpha) \Omega^{-1} \left[\omega^l - \sum v^l \omega^l \right]
 \end{aligned}$$

However

$$\left[\sum v^l = 1 \right]$$

Thus

$$\begin{aligned}
 x^l - e &= \Omega^{-1} (\mu - r_l) [\alpha - \alpha] + (1 - \alpha) \Omega^{-1} \left[\omega^l - \sum v^l \omega^l \right] \\
 x^l - e &= (1 - \alpha) \Omega^{-1} \left[\omega^l - \sum v^l \omega^l \right] \\
 x^l - e / (1 - \alpha) &= \Omega^{-1} \left[\omega^l - \sum v^l \omega^l \right]
 \end{aligned}$$