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Home Equity Bias through Asymmetric Information

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Kurzfassung

Das Equity Home Bias Puzzle ist das Verhalten von Akteuren, wenn sie ihre Investitionen in ihrem Heimatland im Vergleich zu anderen übergewichten. Sowohl der Wirtschaftstheorie als auch dem gesunden Menschenverstand zufolge besteht die erste Regel bei Investitionen darin, Investitionen in so viele verschiedene Vermögenswerte wie möglich zu diversifizieren, die unkorrelierte Renditen aufweisen [Markowitz, 1952]. Im Rahmen offener Volkswirtschaften, die miteinander interagieren, würde eine naive Perspektive darauf hinweisen, in jedes Land gemäß einer Reihe von Regeln zu investieren, die kein Land übergewichten würden, wenn dies nicht auf seinem Marktanteil beruht. Diese Art von Ansichten werden beispielsweise in den grundlegenden Aufbauten einfacher Modelle verwendet, die verstehen sollen, wie der internationale Austausch zwischen Ländern in jeder Hinsicht gleich ist, um sich gegen Unsicherheiten hinsichtlich der Ausstattung oder Produktion abzusichern [Obstfeld and Rogoff, 1996]. In diesem einfachen Fall würde das Land seine Investitionen mit gleichem Gewicht zwischen allen Ländern in seinem Modell differenzieren.

Das Hauptziel dieser Arbeit ist es, ein einfaches theoretisches Modell zu erstellen, das das Equity Home Bias Puzzle durch einen asymmetrischen Informationsaufbau erklären kann. Das Modell stellt eine 2-Länder-2-Perioden-Ausstattungswirtschaft mit infinitesimal kleinen und gleichen Agenten dar, wobei die beiden Länder Inland und Ausland einen Teil ihrer Ausstattung investieren müssen, um in Periode 2 zu konsumieren. Das bedeutet, vollständige Abschreibung zwischen den beiden Perioden. Darüber hinaus besteht zwischen den beiden Perioden Unsicherheit über die Rendite der Investitionen in beiden Ländern. Daher müssen die Versicherungsagenten selbst entscheiden, wo und in welcher Höhe sie in den beiden Ländern investieren.

Stellen Sie sich vor, die Länder liegen auf zwei unterschiedlichen abgelegenen Inseln, die jeweils einen Vulkan haben. Es besteht die Möglichkeit α, dass der Vulkan im Inland nicht ausbricht, und die Möglichkeit β, dass im Ausland nicht ausbricht. Lassen Sie uns von nun an die Perspektive des Inlandes einnehmen. Der Hauptmechanismus, durch den das Modell funktioniert, besteht darin, dass das Inland eine genauere Wahrscheinlichkeit für die Wahrscheinlichkeit eines Nichtausbruchs im Inland und eine sehr ungenaue Wahrscheinlichkeit für das hat, was im Ausland passieren wird. Unter der Annahme, dass die beiden Länder symmetrisch sind, gilt das Gleiche für das Ausland. Die Wahrscheinlichkeit dessen, was aus der Perspektive des Inlands im Ausland passieren wird, beträgt $E[\beta]$ ($E[\alpha]$ aus der Perspektive des Auslands).

Um ihre Situation zu verbessern, können die Agenten beschließen, einen Preis von

τ zu zahlen, um bessere Informationen aus dem anderen Land zu kaufen. Diese Informationen sind jedoch immer noch nicht so gut wie die Informationen, die die Agenten über ihr eigenes Land haben. Diese Wahrscheinlichkeitsmenge wird als α^* für das Ausland und β^* für das Inlandsland bezeichnet. Bei einer bestimmten präzisen Struktur der Wahrscheinlichkeiten, bei der die verrauschteren kleiner sein müssen als die präziseren, unter Verwendung von CRRA-Nutzenfunktionen, wodurch die Verkäufer passiv und die Agenten infinitesimal klein gemacht werden, um das Endergebnis nicht zu beeinflussen, und beide zwischen den beiden Zeiträumen den gleichen Betrag sparen, ist es möglich, ein Gleichgewicht zu finden, bei dem ein Inlandsbias vorhanden ist, wenn die Agenten ihre erwarteten Erträge maximieren.

Abstract

The equity home bias puzzle is the behavior of agents when they overweight their investments in their home country compared to the others. Following both the economic theory, but also common sense, the first rule of investments is to diversify the investment in as many different assets that have uncorrelated returns [Markowitz, 1952]. In the setting of open economies that interact with each other, a naive perspective would point out investing in each country according to a set of rules that would not overweight any country if not based on its share in the market. These types of views are used, for example, in the basic setups of simple models meant to understand how international exchange between countries, is equal in every aspect, in order to insure themselves from uncertainty on endowment or production [Obstfeld and Rogoff, 1996]. In this simple case, what would happen is that the country differentiates their investment with equal weight between all the countries in the model.

This thesis has the main goal of building a simple theoretical model that can explain the equity home bias puzzle through an asymmetric information setup. The model presents a 2-country 2-period endowment economy with infinitesimally small and equal agents where the two countries Home and Foreign must invest part of their endowment to consume in period 2. Meaning, full depreciation between the two periods. Moreover, in between the two periods, there is uncertainty about the returns of the investments in both countries. Hence, agents to insure themselves have to choose where and in which amount to invest in the two countries.

Imagine the countries being on two distinguished remote islands which have a volcano each. There is a possibility α that the volcano in the Home country will not erupt and a possibility β that will not erupt in Foreign. From now on, let us take the Home perspective. The main mechanism through which the model works is that Home has a more precise probability on probability of a non-eruption in Home and a very noisy probability of what will happen in Foreign. By assumption, the two countries will be symmetric, so the same goes for Foreign. The probability of what will happen in Foreign from the perspective of Home is $E[\beta]$ ($E[\alpha]$ for Foreign perspective).

To improve their situation, the agents can decide to pay a cost τ to buy better information from the other country. However, this information is still not as good as the information that the agents have about their own country. This set of probabilities is referred to as α^* for Foreign and β^* for Home. Given a certain precise structure of the probabilities, where the noisier must be smaller than the more precise, using CRRA utility functions, making the sellers passive, the agents infinitesimally small so as to not affect

the final outcome, and that they both save the same amount between the two periods, it is possible to find an equilibrium in which home bias is present when agents maximize their expected returns.

Contents

1 Introduction

After the crises of 2008, the field of International Economics has taken a more central role in the macroeconomic debate. Although it has a long history of successful and brilliant researchers, this strand of macroeconomics still brings itself unresolved issues famously known as puzzles. In particular, international economics has eight pending puzzles that need an answer. A key attempt to solve at least six of them was made by Obstfeld and Rogoff [Obstfeld and Rogoff, 2000]. In this famous paper, they addressed six major puzzles using the concept of iceberg costs. Yet, for the Home-bias puzzles, this modelling framework seems to be incomplete in catching the nowadays underlying economic phenomenon.

Before moving on, let us take a step back and state precisely what is the home bias puzzle. Following both the economic theory, but also common sense, the first rule of investments is to diversify the investment in as many different assets that have uncorrelated returns [Markowitz, 1952]. In the setting of open economies that interact with each other, a naive perspective would point out investing in each country according to a set of rules that would not overweight any country if not based on its share in the market. These types of views are used, for example, in the basic setups of simple models meant to understand how international exchange between countries, is equal in every aspect, in order to insure themselves from uncertainty on endowment or production [Obstfeld and Rogoff, 1996]. In this simple case, what would happen is that the country differentiates their investment with equal weight between all the countries in the model.

However, the data tells us a different story. In fact, all countries are far away from this naive benchmark and the majority of their investments are in their own country. Summing up, the home-bias puzzle can be defined as the phenomenon in which agents tend to invest more in their own country than in foreign ones. A.V. Mishra's paper gives an in-depth statistical analysis of the many countries that still have persistent home bias [Mishra, 2015].

In the last 20 years, the transaction costs in the financial market [Frazzini et al., 2018] [Ardalan, 2019], but also in the goods one [Jacks et al., 2008], have reduced significantly making the iceberg cost modelling tool inadequate to convey the analytical result. The first to point at this possibility was already [Obstfeld and Rogoff, 2000] in their paper. Yet, the data continues to show the presence of the home bias puzzle.

With this paper, I would like to sketch out a simple theoretical framework that can explain the home bias puzzle in light of the current economic and financial characteristics.

Mainly, I would like to emphasize more the role of information and how it shapes investment decisions and exposition towards risk.

With a model based on iceberg costs, it is not possible to observe the exposition towards risk; while an information-based model can give a richer explanation for this important phenomenon. Hence, a home asset is not preferred anymore compared to a foreign asset, because of implied costs in the purchase, but because the information over the second asset is less precise, making the variance and the covariance increase. This would constitute an incentive for the agent to buy home assets.

1.1 The contribution

The main contribution of this thesis is to detail a simple theoretical model that can explain the equity Home bias puzzle through the chain of asymmetric information. The model will take the Obstfeld and Rogoff, 2000 model as the main reference but it will change the crucial mechanism in which the home bias was shown.

This is not the first model that has this aim, however, the literature on information-based home bias is often mathematical intense and the results they achieve are not as realistic as the transportation costs ones Obstfeld and Rogoff, 2000. Moreover in this model, there will be the possibility for the agents to improve their information of the other country. However, it will be shown that this improves just marginally their ability to fully insure themselves. Hence, the Home bias will persist even with this possibility.

To simplify the information-based models, information sets will be modelled such that the value they can have already internalizes the preciseness they have. Moreover, as said before, another novelty of this thesis model is the presence of a two-stage decision process. Mainly, the agents can decide whether to improve or not the preciseness of the information they have on the Foreign country paying a cost. The trade-off the agents are facing is to reduce their endowment to have a more precise expected return on the other country.

In synthesis, this model is trying to mix the transportation costs set up, which provided simplicity and realistic results, of Obstfeld and Rogoff, 2000 and mixing it with the information-based explanations, which seems nowadays a more sound hypothesis of the equity home bias phenomenon.

Before moving to the actual model, to better appreciate the contribution of this thesis, let us explore more in detail what has been done before by other illustrious scholars.

2 Literature Review

The home bias in equity portfolios puzzle was highlighted in the literature for the first time by the paper of French and Poterba (1991) showing that US citizens had invested around 94% of their equity wealth in US stock. Although, this has not been just a characteristic of US citizens, but also of Japanese and other developed countries. In [Tesar and Werner, 1995], it is possible to find the level of home bias level for the U.K., Germany, Canada, U.S., and Japan.

In the strand of literature that has tackled this puzzle, the most influential paper is the [Obstfeld and Rogoff, 2000] paper. In fact, they tried to answer the majority of the international economics puzzles with the use of trade costs in the form of iceberg costs. The main takeaway from this paper is that the transaction costs that are applied to the foreign assets work as friction to buy them. In this case, the ratio of prices would be different from one, creating an incentive for the home (foreign) country to stick with her own asset. However, as I stated before, trade costs have decreased enormously in the last 20 years [Ardalan, 2019] [Frazzini et al., 2018] and this makes the analytical framework of this explanation outdated.

Moving forward to similar approaches to the one this paper wants to have, models with information asymmetries have been developed primarily by [Gehrig, 1993], [Brennan and Cao, 1997], and [Brennan et al., 2005]. They have implemented two-country noisy rational expectation models, where investors are better informed about domestic shocks. Hence, when shocks are about to happen because the signal that they receive from the foreign country is less precise, foreign stocks appear as riskier. Another worth mentioning paper is [Coval, 1999] which implemented this setup in an infinite horizon nosy rational-expectations equilibrium model. Agents receive noisy information about the fundamentals of the foreign country. The main drawback of this type of model is the inability to produce realistic results that would corroborate what the data show. In other words, this means that the Home bias these models create is not enough strong to resemble the data.

Lastly, another strand of this literature lets the acquisition of information be derived endogenously within the model. Here, information is thought of as a tool to reduce the variance of asset payoffs. The biggest contributions in this strand of literature are given by [Van Nieuwerburgh and Veldkamp, 2009] [Van Nieuwerburgh and Veldkamp, 2010]. This type of model, using Sims' model of rational inattention [Sims, 2003], starts from a framework in which domestic agents have a small advantage towards domestic stock, and creates a framework in which domestic agents want to discover more about domestic

stocks because they appear less risky. This is the opposite mechanism which is induced in this thesis' model. In fact, although the information is endogenously given, the agents can choose to buy some information from the other country to insure themselves over a possible shock in the home economy.

Now, it is finally time to go over the model of this thesis.

3 Model's Assumptions

3.1 Model description

The model aims to show how asymmetric information impacts the choice of how much to expose oneself to foreign assets in a simple setting from the demand side, meaning that by assumption the sellers in this model are passive. The model has a simple two-period two-country open endowments economy, where the two countries are the same in every aspect except for the possibility of an exogenous shock in the country. More on this later on. The countries are populated with a finite amount of equal and infinitesimally small agents, hence, their actions can be summarized by a representative agent. The infinitesimally small agents assumption implies that their single behavior will have a negligible impact on the prices. In the first period t_1, the countries receive a fixed perishable endowment, so the representative agents have to decide the amount to consume in t_1 and the amount to invest to consume it in t_2.

The only way to carry endowment through periods is to use it for production and consuming its dividends. This sector is considered exogenous in the model. There is just one asset per country which is an aggregate of the productivity performance of the country. Without the shock, the return that each asset would have is fixed to $r = 1$

Between the two periods, there could be a negative shock that would affect the dividends that the two assets give. The probability of the negative shock not happening is α, while $1 - \alpha$ is the probability that the shock happens, with $\alpha \in (0, 1]$. On the other hand, β is described in the same way as α but for the other country. The two countries' probabilities of a good or bad state of nature are independent. This can be thought of in the following way. Assume each country is on a remote island far from each other. On these islands, there is a volcano that can erupt and destroy part of the production sector of the two countries. The probability with which the volcanoes will erupt is independent of one another. When there is a favourable case, the return of the stocks will follow the exogenous return rate of capital r, and as I mentioned above, for simplicity, we will consider $r = 1$. When the negative shock happens, there is a negative return rate of capital $r < 1$ which impacts the consumption in t_2.

3.2 Assumptions on preferences

Each country has its own representative agents that are entitled to choose how to allocate the investments for consumption in t_2. They both have CRRA utility functions with

σ being the coefficient of relative risk aversion and $\rho = \frac{1}{\sigma}$. Moreover, because the representative agents are facing a sequential decision, there could be the possibility of having strategic behavior. However by assumption, this possibility will not be allowed, meaning that the two representative agents will behave in the same way and whenever one will find optimal to buy or not the information, the other will find optimal the same. This consequence is given by the assumption of sellers' passiveness.

3.3 Assumptions on returns

At t_1, the representative agents know the distribution of their country's possibility of a shock, but they are not aware of the other country's shock distribution. To avoid it they can ask a geologist (to stick with the volcanoes example made before) to predict the stock market of the other country. In this case, they have to pay a fixed amount τ to the geologist. The geologist is not omniscient, hence, she gives a prudent distribution function of the others' country volcano eruption. So, with probability β there not is a shock in t_2, and with probability $1 - \beta$ there is in the foreign country, where $\beta \in (0, 1]$. With the expression $r(\alpha)$ and $r(\beta)$, it means the dependence of the interest rate on the probability of not having a shock. When $\alpha = 1$ there will be no shock with certainty, and when $\alpha = 0$ there will be a shock with certainty. The same goes for $r(\beta)$. Hence, it is possible to simplify the notation by writing just α and β to indicate the returns the two assets have, or $E[\alpha]$ and $E[\beta]$, when the expected returns' distributions are not known. On the other hand, when there with α^* and β^* the probability distribution the two countries can buy from the geologist. Mainly, Home can buy β^*, while foreign α^*. In the actual computation of the model the notation $r(\alpha)$ (and $r(\beta)$, will disappear in favor of the information type that the agents will have. By assumption, the expected return is linked to the type of model the agents hold. Hence, instead of reporting of $r(\alpha), r(\alpha^*), r(E[\alpha])$, it will be reported just the type of information they will have. This is made to the effort of keeping the notation lean. Last note to keep the model simple and tractable, the focus will be on the asset allocation, meaning to maximize the expected return of endowment in $t = 2$, and not on the investment decision. Hence, it is assumed the two representative agents save the same amount between the two periods ($Y_H = Y_F^*$). In particular, this is done to avoid to use of numerical methods when solving for the cost that makes indifferent the agents between buying the information or not.

3.4 Assumptions on the probabilities

The structure above implies the presence of three different information sets, depending on which asset it is considered and whether the information on the other country's asset has been bought or not. I denoted α (β), as the probability of not having a shock in Home (Foreign) from their perspective. Then, α^* (β^*) is the probability distribution of not having a shock when Foreign (Home) buys information over Home (Foreign). The last set is $E[\alpha]$ ($E[\beta]$), which is the probability distribution of Foreign (Home) on the non-shock in Home (Foreign) when not buying the information.

It will be assumed that these three information sets are not equally precise, and moreover, they have a precise ranking from the perspective of the agents. The structure is the following: α is more precise than α^* and more precise than $E[\alpha]$, the same goes for β. Paying the fixed cost τ gives an information advantage such that α^* is more precise than $E[\alpha]$, but still less precise than α. The same relationship holds for β. That the Home country has better knowledge of its own asset is a common assumption in the literature [Gehrig, 1993], [Brennan and Cao, 1997], [Brennan et al., 2005] and reflects the idea that agents are more familiar and can collect in an easier way the information over their country than on the other country.

In simple words, it is assumed that preference-wise, the agents will have the following ranking over the information sets: $\alpha \succ \alpha^* \succ E[\alpha]$, and $\beta \succ \beta^* \succ E[\beta]$. In the end, the key assumption of the model is that the probabilities will have the following structure between the different information sets:

$$0 \leq E[\alpha] < \alpha^* < \alpha \leq 1$$
$$0 \leq E[\beta] < \beta^* < \beta \leq 1$$

This assumption has the goal to internalise the idea expressed before that each country has more precise information about its own assets. This preciseness in this model is expressed with a higher probability of not having a shock.

4 Model Equilibrium

4.1 Dynamic of the model

Let's now consider the maximization problem. Each representative agent first has to choose whether she wants to buy the information from the geologist or not. Because she is facing a sequential decision, she uses backward induction. First, let's maximize the utility function when she doesn't buy the information. Secondly, she maximizes her utility but this time acts as if she buys the information. Lastly, she computes the indifferent value of the cost for which she would be indifferent between buying the information or not buying it. Whenever the actual cost is higher than the threshold cost, it will be optimal to not buy the information, when lower it will be optimal to buy it.

Before moving with the actual maximization, it is important to say that although the representative agents are facing uncertainty in exchanging, the prices the representative agents face are the same. So, let's denote P_H and P_F as the prices for country H of respectively the Home asset and the Foreign one, and P_H^* and P_F^* the prices for country F of the Home asset and Foreign one. For the reasons mentioned before, in this market, the law of one price holds, so there is:

$$P_H^* = P_H$$
$$P_F = P_F^*$$

4.2 Sub-equilibrium without buying information

Now, it is possible to start with the first case. Because the two representative agents have the same preferences and constraints, it is possible to solve the maximization problem for just one of them, and the other's results will be symmetrical. Let's define C_H and C_F respectively as the consumption of the Home asset and the Foreign one. Then, the maximization problem for Home is:

$$E[U(C)] = E\left[\frac{1}{1-\rho}\left(C_H{}^{\frac{\sigma-1}{\sigma}} + C_F{}^{\frac{\sigma-1}{\sigma}}\right)^{\frac{\sigma}{\sigma-1}}\right]^{1-\rho} \tag{4.1}$$

$s.t.$

$$\alpha P_H C_H + E[\beta] P_F C_F = \alpha P_H Y_H \tag{4.2}$$

From here, it is possible to set up the Lagrangian and find out the optimal demand for

both goods for Home.

$$\mathcal{L} = E[U(C)] + \lambda_H[\alpha P_H Y_H - [\alpha P_H C_H + E[\beta] P_F C_F]]. \tag{4.3}$$

The F.O.C.s of the maximization problem with respect to C_H and C_F are the following:

$$(C_H)^{-\frac{1}{\sigma}} = \lambda_H \alpha P_H$$
$$(C^F)^{-\frac{1}{\sigma}} = \lambda_H E[\beta] P_F.$$

Because the two countries are symmetric, we will have the following F.O.C.s for Foreign:

$$(C_H^*)^{-\frac{1}{\sigma}} = \lambda_F E[\alpha] P_H^*$$
$$(C_F^*)^{-\frac{1}{\sigma}} = \lambda_F \beta P_F^*$$

The symmetry implies also that $\lambda_H = \lambda_F$ and from this it is possible to find the following conditions:

$$\alpha(C_H)^{-\frac{1}{\sigma}} = E[\alpha](C_H^*)^{-\frac{1}{\sigma}}$$
$$E[\beta](C_F)^{-\frac{1}{\sigma}} = \beta(C_F^*)^{-\frac{1}{\sigma}}$$

The market clearing conditions for both assets require:

$$\alpha(C_H + C_H^*) = Y_H$$
$$\beta(C_F^* + C_F) = Y_F^*$$

These last 4 equations yield the following market equilibrium:

$$C_H = \frac{\alpha^{\sigma-1}}{\alpha^\sigma + E[\alpha]^\sigma} Y_H \tag{4.4}$$

$$C_F = \frac{E[(\beta)]^\sigma}{\beta(\beta^\sigma + E[(\beta)]^\sigma)} Y_F^* \tag{4.5}$$

$$C_H^* = \frac{E[(\alpha)]^\sigma}{\alpha(\alpha^\sigma + E[(\alpha)]^\sigma)} Y_H \tag{4.6}$$

$$C_F^* = \frac{\beta^{\sigma-1}}{(\beta)^\sigma + E[\beta]^\sigma} Y_F^* \tag{4.7}$$

4.3 Sub-equilibrium buying information

Now, let's see which is the maximization problem when the representative agents decide to buy the information τ. It would look like this, where α^* and β^* are the medium value

of the predictions the geologists make:

$$E[U(C)] = E\left[\frac{1}{1-\rho}\left(C_H{}^{\frac{\sigma-1}{\sigma}} + C_F{}^{\frac{\sigma-1}{\sigma}}\right)^{\frac{\sigma}{\sigma-1}}\right]^{1-\rho} \tag{4.8}$$

$s.t.$

$$\alpha P_H C_H + \beta^* P_F C_F + \tau = \alpha P_H Y_H \tag{4.9}$$

From here, following the same steps followed before, meaning, writing the Lagrangian, finding the F.O.C.s and equating them with Foreign, the four equations that will determine the equilibrium are:

$$\alpha(C_H)^{-\frac{1}{\sigma}} = \alpha^*(C_H^*)^{-\frac{1}{\sigma}} \tag{4.10}$$

$$\beta^*(C_F)^{-\frac{1}{\sigma}} = \beta(C_F^*)^{-\frac{1}{\sigma}} \tag{4.11}$$

$$\alpha(C_H + C_H^*) = Y_H \tag{4.12}$$

$$\beta(C_F + C_F^*) = Y_F^* \tag{4.13}$$

$$\tag{4.14}$$

Just for the remainder, (3.10) and (3.11) are the outcome of the F.O.C.s of the two countries, while (3.12) and (3.13) are the market clearing conditions.

In the end, the equilibrium in this case will be:

$$C_H = \frac{\alpha^{\sigma-1}}{\alpha^\sigma + (\alpha^*)^\sigma}(Y_H - \tau) \tag{4.15}$$

$$C_F = \frac{(\beta^*)^\sigma}{\beta(\beta^\sigma + (\beta^*)^\sigma)}(Y_F^* - \tau) \tag{4.16}$$

$$C_H^* = \frac{(\alpha^*)^\sigma}{\alpha(\alpha^\sigma + (\alpha^*)^\sigma)}(Y_H - \tau) \tag{4.17}$$

$$C_F^* = \frac{\beta^{\sigma-1}}{(\beta)^\sigma + (\beta^*)^\sigma}(Y_F^* - \tau) \tag{4.18}$$

Given the assumption made on the probabilities, their ranking and values, there will be Home bias in both cases. That said, to complete the equilibrium, it remains to find the indifferent condition for buying or not the information to finalize the equilibrium.

4.4 Indifference condition of τ

Now, it is time to find the cost value that makes indifferent the representative agents buy the information or not. To do so, it is possible to take the optimal C_H and C_F (always from the point of view of Home) when buying and not buying the information and plug them in the utility function. Equating the two and isolating τ, it is possible to find this condition.

Referring to U_H^τ, C_H^τ, and C_F^τ as the level of utility, the share of the home asset, and share of foreign assets for the Home country when its representative agent decides to buy the information, and using the assumption for which $Y \equiv Y_H = Y_F^*$ we can write:

$$\begin{aligned} &U_H = U_H^\tau \\ &\left[\frac{1}{1-\rho}\left[\left(\frac{\alpha^{\sigma-1}Y}{\alpha^\sigma + E[\alpha]^\sigma}\right)^{\frac{\sigma-1}{\sigma}} + \left(\frac{E[\beta]^\sigma Y}{(\beta(E[\beta]^\sigma + \beta^\sigma)}\right)^{\frac{\sigma-1}{\sigma}}\right]^{\frac{\sigma}{\sigma-1}}\right]^{1-\rho} = \\ &\left[\frac{1}{1-\rho}\left[\left(\frac{\alpha^{\sigma-1}(Y-\tau)}{\alpha^\sigma + \alpha^{*\sigma}}\right)^{\frac{\sigma-1}{\sigma}} + \left(\frac{\beta^{*\sigma}(Y-\tau)}{(\beta(\beta^{*\sigma} + \beta^\sigma)}\right)^{\frac{\sigma-1}{\sigma}}\right]^{\frac{\sigma}{\sigma-1}}\right]^{1-\rho} \end{aligned}$$

After some manipulations with the goal of isolating τ, we have:

$$\tau = Y - Y\left(\frac{(\alpha^\sigma + \alpha^{*\sigma})\beta(\beta^{*\sigma} + \beta^\sigma)[\alpha^{\sigma-1}\beta(E[\beta]^\sigma + \beta^\sigma) + E[\beta]^\sigma(\alpha^\sigma + E[\alpha]^\sigma)]}{[\alpha^{\sigma-1}\beta(\beta^{*\sigma} + \beta^\sigma) + \beta^\sigma(\alpha^\sigma + \alpha^{*\sigma})][(\alpha^\sigma + E[\alpha]^\sigma)\beta(E[\beta]^\sigma + \beta^\sigma)]}\right)^{\frac{\sigma}{\sigma-1}} \tag{4.19}$$

This means that whenever the cost is higher than this threshold τ, then the representative agents of each country will never buy information. On the other hand, when smaller, it will be optimal for them to do so. It is important to note that, although the calculations were done starting from the Home perspective, the same results would be reached if taking the Foreign perspective.

As reported above in the assumption, the need to assume the endowments that each representative agent of each country decided to bring between the two periods, meaning $Y \equiv Y_H = Y_F^*$, comes to give an analytical solution to the equilibrium. In fact, when assuming the contrary, meaning $Y_H \neq Y_F^*$, the final equilibrium can be computed just by numerical methods.

5 Conclusions

5.1 Why asymmetric information over transportation costs

This topic has already been touched upon in the Introduction, however before concluding, it seems appropriate to say something more about it. Given that [Obstfeld and Rogoff, 2000] are very aware of the drawbacks of their setup, and the goal of their paper is broader than tackling the equity home bias, the transportation cost explanation did not age well for financial assets.

Starting with the latter, the financial globalization that happened in the last decades has decreased the transaction costs for financial assets and increased the trade volume by a lot [Ardalan, 2019]. While Before investing in a foreign country was very difficult and such assets were not offered by the bank, nowadays is way easier and cheaper. Yet, as pointed out already, [Mishra, 2015] showed that all the countries, in the sample he analyzed and with different frameworks, present home bias. Hence, the transportation costs cannot be an appropriate explanation for this.

On the other hand, the information-based explanation can be a richer explanation. In fact, usually, human beings tend to perceive as less risky, so invest more, in what they think they know best. A plastic representation of this is the [Coval and Moskowitz, 1999] paper. In this paper, the authors show that investment managers in the U.S. prefer to invest more in firms whose headquarters are located locally rather than firms whose headquarters are further away. In the end, there is home bias even in the same country.

5.2 Conclusions

In conclusion, the thesis has shown that with a simple setup is possible to detail a model with equity home bias that can potentially be more realistic in the outcomes than other models of the same categories, such as [Brennan and Cao, 1997], [Brennan et al., 2005], [Coval, 1999], and [Gehrig, 1993].

Although the results are mainly driven by the assumptions set on the expected returns, another novelty that the model presents is the 2-step sequential decision that the representative agents face. In fact, also in the case in which it is optimal to buy the information, there will be home bias, although with lower intensity.

That said, the equity home bias puzzle is yet to be solved and other mechanisms could

driven it. For example, what is implemented through asymmetric information in this model could also be explained as political uncertainty in another country. In this case, investing more in the home country than abroad could be justified as the increasing difficulty in informing oneself about political changes in other countries, mainly in the business policies.

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