Economics Letters 121 (2013) 282–286

Contents lists available at ScienceDirect

Economics Letters

journal homepage: www.elsevier.com/locate/ecolet

Cross-border equity portfolio choices and the diversification motive: A fractional regression approach

F.M. Pericoli [a], E. Pierucci [b], L. Ventura [c,*]

[a] Italian Ministry of Economy and Finance, Via XX Settembre 97, 00187 Roma, Italy
[b] University of Basilicata, Via dell'Ateneo Lucano 10, 85100 Potenza, Italy
[c] University of Roma "La Sapienza", Via del Castro Laurenziano 9, 00161 Roma, Italy

HIGHLIGHTS

- The paper models international portfolio investment positions as a choice of (bilateral) portfolio shares.
- Fractional regression models are used to model those shares.
- Using fractional regression models has important consequences in terms of results, with respect to more traditional models.
- A panel dataset was used, which allows controlling for unobserved heterogeneity, via proper (country pair) fixed effects.
- Both trade and a proxy for diversification motives are important determinants of portfolio shares.

ARTICLE INFO

Article history:
Received 8 March 2013
Received in revised form
23 August 2013
Accepted 24 August 2013
Available online 30 August 2013

JEL classification:
F21
G11

Keywords:
Portfolio choice
Risk sharing
Fractional regression models

ABSTRACT

Using a panel fractional regression model to evaluate the determinants of shares of international investment positions, we find some strong empirical support to the claim that a diversification motive is relevant. It turns out that less synchronized economies attract larger portfolio investment shares. The utmost relevance of trade relationships among countries in shaping international investment positions is also confirmed.

1. Introduction

The era of financial globalization has led to a remarkable increase in the cross-border trading of financial assets, a phenomenon which has spurred the interest of the economic literature in the field during the past decade. The most recent contributions examine the issue mainly from an empirical perspective, with the aim of identifying the determinants of international portfolio choices. The leading paradigm in this strand of literature is the gravity model, first adapted to the analysis of international trade of goods and services by Tinbergen (1962), and further developed to deal with patterns of equity portfolio investments by some recent contributions such as Portes and Rey (2005), Lane and Milesi-Ferretti (2008) and Coeurdacier and Guibaud (2011). Using a dataset on bilateral flows of 14 countries for the 1989–1996 period, Portes and Rey (2005) find that gravity models can explain the trading of financial assets as well as goods and services trade flows. Lane and Milesi-Ferretti (2008) apply a similar gravity model to explain bilateral portfolio equity holdings among a very large number of source and host countries, using for the first time the Coordinated Portfolio Investment Survey (CPIS) relative to the year 2001, featuring the data from 67 source countries and 218 host countries. Subsequently, a growing number of contributions using the CPIS and gravity models investigate equity investment patterns; among the most relevant, Coeurdacier and Guibaud (2011) explore how cross-border trading of equity assets is affected by the correlations between foreign and domestic stock returns (between 2001 and 2005). Using the CPIS, Mishra (2007) confirms the Portes and Rey (2005) results about the correlation between equity investments and patterns of trade in goods and services. The same

* Corresponding author. Tel.: +39 0649917052.
E-mail address: luigi.ventura@uniroma1.it (L. Ventura).

0165-1765/$ – see front matter
http://dx.doi.org/10.1016/j.econlet.2013.08.026

finding is confirmed by Aviat and Coeurdacier (2007) by means of a more sophisticated simultaneous gravity approach. The relevance of cultural-institutional proximity, information asymmetries, and the quality of institutions is detected by Mishra (2007) and by Balli et al. (2011), with regard to the sample of Gulf Cooperation Council Economies taken from CPIS. Some of these contributions found weak evidence of a diversification motive in the allocation of international investments, and the question is still open.

We would like to contribute some empirical evidence to support the claim that a diversification motive is indeed at work in shaping international portfolio investments. We pursue this objective in several ways: proposing a gravity model in equity shares; applying a new and more appropriate estimation technique, (i.e. the fractional regression approach); introducing a new variable representing the diversification motive, given by the correlation between idiosyncratic components of GDP[1]; and using a large panel dataset allowing for the inclusion of pair fixed effects.

One of the main novelties of our approach is the empirical specification of a gravity model, where the variable of interest is the share of portfolio of country i allocated to assets of country j, rather than the amount in nominal or real terms as in the previous related studies. This choice is based on various reasons, which we believe increase the overall quality and robustness of the results. First, it is a common practice for professional investors to define their investment strategies in terms of portfolio composition, i.e. as shares of total assets. Therefore, shares seem a natural and better choice than absolute investments when modeling investor behavior. Second, moving to a model of shares greatly reduces the risk of estimating a model with a non-stationary response variable,[2] i.e. the probability of obtaining spurious results. Third, a share is, by definition, a pure number without any economic dimension, a fact that reduces the need for deflation related procedures and adjustments required to compensate for exchange rate fluctuations, which are often controversial.

The choice of a model whose dependent variable is given by portfolio shares has relevant implications on the estimation method to be applied. In fact, as shown by Papke and Wooldridge (2008), when the dependent variable is bounded between zero and one, standard models do not provide an accurate picture of the impact of covariates, for a bunch of statistical reasons. For instance, linear models may generate predictions outside the admissible interval [0, 1], while models estimated on the log-odds transformation of variables are not defined for the boundary values 0 and 1 unless *ad hoc* adjustments are made. A two-limit Tobit model is not easy to justify when applied to a naturally bounded variable given that observations at the boundaries result from individual choices and are not the consequences of censoring (Ramalho et al., 2011; Maddala, 1991).

Thus, we apply a proper fractional regression method (Papke and Wooldridge, 2008) on the model specified in shares and on the same sample of countries (source and host) as in Lane and Milesi-Ferretti (2008). We conduct the analysis at a panel level to exploit the time dimension of data[3] taking nine waves of the CIPS (2001–2009). Section 2 describes the empirical model and the estimation results. Section 3 provides some concluding remarks.

2. The empirical model

In what follows we focus on the empirical identification of the determinants of international equity trading,[4] with special emphasis on the relevance of a diversification motive. Previous contributions in the field have generally specified econometric models where the stock of equities held from residents of country i and issued by residents of country j, is regressed against a set of variables measuring the extent of the interaction, the proximity and the degree of institutional integration reached by the two economies. On the contrary, for the reasons explained in the previous section, we propose an empirical model where the variable of interest is the share of country i's equity holdings in the foreign country j.

Thus, we denote our variable of interest by s_{ijt}, the share of country i's international equity portfolio held in country j at date t, $s_{ijt} \in [0, 1]$. Despite the existence of a large variety of economic phenomena where the variable of interest is naturally expressed in terms of a share,[5] only recently has the econometrics profession seriously considered the issue of fractional regression models. Papke and Wooldridge (1996) have proposed a quasi-likelihood estimation method for cross-section fractional regression models where the dependent variable lies in the closed interval [0, 1]. The same framework has been extended to handle the panel data by Papke and Wooldridge (2008), which is the main methodological reference for our work. In order to simplify the notation, let us indicate the generic ordered pair (i, j) by p, so that s_{pt} represents the generic foreign asset share of a given country's portfolio at date t. If we denote by $\mathbf{X}_{pt}$ a $1 \times K$ vector of explanatory variables for the generic pair of source/host countries at date t, our econometric model for shares of cross-border trading of equity assets (s_{pt}) reads as follows:

$$E(s_{pt}|\mathbf{X}_{pt}, c_p) = \Phi(\mathbf{X}_{pt}\boldsymbol{\beta} + c_p), \quad t = 1, 2, \ldots, T \tag{1}$$

where $\Phi(.)$ represents the standard normal cumulative distribution function and c_p represents individual unobserved factors specific to each (i, j) pair of countries. Moreover, we require the two additional assumptions of strict exogeneity and of conditional normal distribution of unobserved effects:

$$E(s_{pt}|\mathbf{X}_{p1}, \mathbf{X}_{p2}, \ldots, \mathbf{X}_{pT}, c_p) = E(s_{pt}|\mathbf{X}_{pt}, c_p) \tag{2}$$

$$c_p|(\mathbf{X}_{p1}, \mathbf{X}_{p2}, \ldots, \mathbf{X}_{pT}) \sim Normal(\psi + \bar{\mathbf{X}}_p\boldsymbol{\xi}, \sigma_a^2). \tag{3}$$

Under these assumptions, $\boldsymbol{\psi}$, $\boldsymbol{\beta}$ and $\boldsymbol{\xi}$ are consistently estimated up to a common scale factor (i.e. the estimated coefficient are $\boldsymbol{\psi_a}$, $\boldsymbol{\beta_a}$ and $\boldsymbol{\xi_a}$ where the subscript a indicates that the original coefficient is divided by $(1 + \sigma_a^2)^{1/2}$). Moreover, Average Partial Effects (hereinafter, APEs), which allow to gauge the relevance of the explanatory variables in the case of models where the impact on the response variable is a function of the covariates, can be identified and consistently estimated. APEs measure the impact of changes in the covariates on the expectation of the response variable averaged across population and can be obtained by differentiating[6]:

$$E_{\bar{\mathbf{X}}_p}[\Phi(\psi_a + \mathbf{X}_t\boldsymbol{\beta}_a + \bar{\mathbf{X}}_p\boldsymbol{\xi}_a)] \tag{4}$$

with respect to the elements of $\mathbf{X_t}$. By the law of large numbers Eq. (4) can be consistently estimated by:

$$N^{-1}\sum_{p=1}^{N}\Phi(\psi_a + \mathbf{X}_{pt}\boldsymbol{\beta}_a + \bar{\mathbf{X}}_p\boldsymbol{\xi}_a). \tag{5}$$

[1] See data Appendix for details on computation of the idiosyncratic GDP.

[2] As an example, in structural macroeconometric analysis, it is a common practice to normalize all the variables of a model with respect to the variable generating the stochastic trend in order to obtain a stationary form of a given non-stationary model.

[3] Data sources and descriptions of the variables are reported in Appendix A.

[4] Our analysis does not include the cross-border trading in non-equity financial assets.

[5] Examples include the degree of internationalization of a given firm as measured by the share of export to total sales, and the share of investments in R&D.

[6] See Wooldridge (2002), Section 15.8.2 and Papke and Wooldridge (2008) for details on derivation of Eqs. (4)–(6).