Economic Modelling 40 (2014) 191–198

Contents lists available at ScienceDirect

Economic Modelling

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

Information and capital flows revisited: The Internet as a determinant of transactions in financial assets

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ARTICLE INFO

Article history:
Accepted 24 March 2014
Available online 4 May 2014

Keywords:
The Internet
Cross-border portfolio flows
Gravity equation
Information asymmetries
Home bias

ABSTRACT

We extend Portes et al. (2001) by introducing the Internet as a variable, and we test the model empirically by using cross-country panel data on portfolio flows between the United States and other countries from 1990 to 2008. Asymmetric information accounts for the strong negative relationship between international asset transactions and distance. The Internet plays an important role in mitigating information asymmetry between countries and increases the volume of cross-border portfolio flows.

1. Introduction

Traditionally, the gravity equation has been used to explain the volume of trade of goods between pairs of countries, mainly in terms of distance and GDP (Bergstrand, 1989; Tinbergen, 1962 etc.). The negative relationship between the volume of international trade of goods and distance is interpreted as the transaction cost. However, it seems puzzling that the gravity equation also fits the transactions of international financial assets, since financial assets are weightless and would incur little transaction cost. In this vein, Portes et al. (2001) and Portes and Rey (2005) did find that information asymmetry is a very important determinant of trade in financial assets. They also explain that the negative correlation between distance and financial assets trade can be attributed to information asymmetry. This implies that as two countries are located farther apart, information asymmetry increases and financial assets trade decreases. They used the international telephone call traffic as a proxy for information flows between two countries and found empirical evidence that increasing information flows can mitigate information asymmetry in the transactions of financial assets. Similarly, Ahearne et al. (2004) show that information costs hinder cross-border equity holdings, by using the share of a country's stock market that is listed in U.S. exchanges.

The Internet has reduced information friction in the financial markets drastically during the last decade. It provides financial investors access not only to the real time information on financial markets via Internet-based news, but also to detailed reports of private firms via their Internet disclosures. Both the quality and quantity of information on financial markets has been sharply enhanced by the Internet. There is empirical evidence that the Internet reduces frictions caused by inaccessibility or lack of knowledge about the financial asset, or regulatory roadblocks in domestic financial markets. Bogan (2008) uses panel data on household participation rates over the past decade in the United States and shows that the Internet has raised households' financial participation rate significantly because it reduces frictions in the financial markets. Choi et al. (2002) find evidence that web-based trading channels increase trading frequency of 401(k) plans. In this sense, it is natural to consider that the Internet has also changed the international financial environment, since the friction caused by information asymmetry is much greater in international financial transactions. Before the advent of the Internet, it would have been difficult for international investors to find information on foreign companies, and the information friction could easily frustrate international financial traders. Nowadays, investors can access the financial information of a foreign company as easily as that of a domestic one.

If information friction is an important driver of trade in international financial markets, it should help explain the volume of transactions. The new developments in information technology must account for the recent dramatic increase in international financial transactions. This leads to the main idea of this paper: to reinvestigate the gravity equations for the international financial markets by taking into account the development of the Internet. If the Internet provides significant information about international financial markets, it might have mitigated the information asymmetry and reduced the explanation power of the gravity model.

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http://dx.doi.org/10.1016/j.econmod.2014.03.027
0264-9993/

The effects of the Internet on macroeconomic variables such as inflation and growth has recently been studied (Choi and Yi, 2008; Yi and Choi, 2005). The Internet also played a positive role in international goods trade (Freund and Weinhold, 2004), international service trade (Choi, 2010; Freund and Weinhold, 2002), and international direct investment (Choi, 2003). Choi (2010) used cross-country panel data for over 110 countries from 1990 to 2007 and found that the Internet reduced information asymmetry between two countries and increased cross-border service flows. These studies on the effect of the Internet on international transactions in goods and financial assets are based mainly on gravity models.

In our paper, we analyze the effect of the Internet on bilateral portfolio flows between the United States and other countries. Here, financial asset transactions include foreign residents' transactions in U.S. corporate stocks, corporate bonds, Treasury bonds and U.S. residents' transactions in foreign (non-U.S.) stocks and bonds. In this paper, we reconfirm that the gravity model for international financial transactions is valid for an extended period and information flows are an important determinant of the volume of transactions. We find that the Internet carries significant information about the international financial markets, which may differ from that available using only telephones, and vitalizes cross-border financial transactions.

The structure of the rest of the paper is as follows. Section 2 describes the model and data, Section 3 outlines the estimation results, and Section 4 presents the concluding remarks.

2. Model and data

We use a version of the standard gravity model to test whether the Internet facilitates portfolio flows as follows:

$$\log(Portfolio_{it}) = \beta_0 + \beta_1 \log(DIST_{it}) + \beta_2 \log(GDP_{it}) + \beta_3 English_i + \beta_4 \log(SOPH_{it}) + \beta_5 \log(TEL_{it}) + \beta_6 \log(Internet_{it}) + u \tag{1}$$

where $t = 1990, 1991, \ldots, 2008$.

The U.S. GDP is the same to all countries and is thus omitted in the equation. *Portfolio* represents the portfolio flows between the United States and a partner country. There are various kinds of portfolio flows: STOCK (foreign residents' transactions in U.S. corporate stocks), BOND (foreign residents' transactions in U.S. corporate bonds), TB (foreign residents' transactions in U.S. Treasury bonds and notes), FSTOCK (U.S. residents' transactions in foreign (non-U.S.) stocks), and FBOND (U.S. residents' transactions in foreign (non-U.S.) bonds) flows. *DIST* stands for the distance between the United States and a partner country. *GDP* is the GDP of partner country. *English* is a dummy variable for English speaking countries. FS represents survey data to indicate the degree of financial skill of a country. TEL is the international telephone call traffic. *Internet* is the number of Internet users, per a hundred people. Natural logarithms (log) are used for all the variables except the *English* dummy. The definitions and sources of the variables are detailed in Appendix A.1. and A.2. The list of countries included in our empirical study is in Appendix A.3.

The coefficient of the distance is expected to be negative. This is because the larger the distance between two countries, the greater the transaction costs and information asymmetry between them. The coefficients of GDP are expected to have positive signs. The coefficient of *English* is expected to have a positive sign. The coefficient of the financial skill is expected to have a positive sign. The United States tends to trade more when the partner country is financially developed. Finally, the Internet is expected to have a positive relationship with the portfolio flows. As usage of the Internet increases, information asymmetry between two countries would decrease, and this would induce portfolio flows between them to increase.

Table 1
Descriptive statistics.

Variable	Obs	Mean	Std. dev.	Min	Max
STOCK	707	66611.86	288310.6	2	3671086
BOND	707	20226.97	112802.1	0	1548650
TB	707	249313.5	1092795	0	1.56E + 07
FSTOCK	707	59032.34	252247.6	0	3511734
FBOND	707	54269.01	215638	0	2190293
GDP	707	563.7491	844.4232	26.42198	5264.852
Internet + 1	707	19.46704	23.91114	1	87.8
Financial skill	707	4.60294	1.124013	1.722	6.8
Distance	707	8811.014	3576.393	1037.087	15810.22

3. Empirical results

Table 1 shows the descriptive statistics for the variables used. The main results are described in Tables 2–6. In each table, six regressions are reported, with various combinations of independent variables and estimation methods. The results for the foreign residents' transactions in U.S. financial markets are summarized in Tables 2–4, while those for U.S. residents' transactions in foreign financial markets are reported in Tables 5 and 6.

Table 2 summarizes the empirical results of the estimations of foreign residents' transactions in U.S. corporate stocks. Note that transactions are referred to as the sum of purchases and sales throughout the period. A pooled OLS (ordinary least squares) is utilized in Eqs. (1)–(3). Year dummies are included as independent variables in Eqs. (1)–(3), but the coefficients are not reported. We performed the Breusch and Pagan (1979) Lagrange multiplier tests, which show that the random effects model should be used. Thus, we provide interpretations of these models in comparison to the OLS. The estimation results of the random effects models are listed in Eqs. (4)–(6). Time invariant variables such as *distance* and *English* can be included in the random effects model, unlike in the fixed effects models.

The significantly negative coefficients of distance (DIST) in Eqs. (1)–(6) reconfirm the power of the gravity model. The signs of the other coefficients are also as expected. The national income (GDP) is positive and significant at the 1% level. The higher the national income, the more the foreign residents' transactions in U.S. corporate stocks. The language barrier can be another source of information asymmetry. The coefficient of the English dummy is positive and significant, except in Eq. (4). The coefficient of the financial skill is positive and significant at the 1% level in all the equations. The coefficients of international telephone call traffic are positive and significant at the 1% level in Eqs. (1), (2), and (4), which is consistent with Portes et al. (2001). The telephone call traffic is a significant determinant of the foreigners' transaction volumes of U.S. stocks.

Eqs. (2) and (5) add the number of Internet users (Internet) to Eqs. (1) and (4). In Eq. (2), both the coefficients of international telephone call traffic and the Internet are positive and significant. The coefficient of international telephone call traffic in Eq. (2) is smaller than that in Eq. (1), which implies that the Internet variable may take over some explanatory power from the equation containing only telephone call traffic. The telephone call traffic becomes insignificant in the random effects model estimation of Eq. (5), while the Internet variable is significant at the 1% level. This could reflect the existence of multicollinearity between telephone call traffic and the Internet.[1]

Lastly, Eqs. (3) and (6) of Table 2 exclude the international telephone call traffic from Eqs. (2) and (5), respectively. The Internet variable is still significant at the 1% level, and its coefficients become a little larger than those in Eqs. (2) and (5).

[1] Pairwise correlation coefficients and their significance levels in parentheses between the distance and the telephone call traffic, between the distance and the Internet, and between the telephone call traffic and the Internet are −0.2320(0.0000), −0.0680(0.1060), and 0.4097(0.0000), respectively. Loss of significance of the distance coefficient could be due to multicollinearity between the distance and the telephone call traffic.