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The determinants of the volatility of returns on cross-border asset holdings

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Keywords

Asset return volatility, financial integration, international portfolio choice, asset holdings, endogeneity bias

JEL Classification

E44, F36, G15

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The determinants of the volatility of returns on cross-border asset holdings*

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1 Introduction

After growing in tandem with gross domestic product (GDP) for most of the first eight decades of the 20th century, (global) financial assets grew at a more rapid pace after 1980 as companies and financial institutions turned increasingly to capital markets for financing. Although a spate of currency and financial crises in the late 1980s and early 1990s interrupted the process, advances in information and communication technology, financial market liberalization and, in particular, the creation of the European Monetary Union (EMU) have contributed to a dramatic surge in global capital flows in recent years. According to Deutsche Bundesbank (2009), total cross-border assets and liabilities documented worldwide amounted to some US$192 trillion at the end of 2007 – reflecting an almost four-fold increase compared with 1999.[1] However, the upheaval in financial markets in late 2008 abruptly halted this decade-long expansion of the global capital market, resulting in an 8% drop in the value of world's financial assets by the end of 2008, the largest decline compared with those seen in the previous economic and financial turmoil seen in 1990–91, 1997–98 and 2000–02 (McKinsey Global Institute 2009). At the time of writing (summer 2012), the financial markets have yet to recover fully from the global financial crisis.

The surge in cross-border capital flows[2] in the first decade of the new millennium has stimulated numerous empirical investigations that can be roughly divided into two strands of literature. The first strand of the literature concentrates on the determinants of bilateral asset holdings, covering[3] the role of geography, culture and information costs (Ahearne et al. 2004, Chan et al. 2005, Portes and Rey 2005); trade (Aviat and Coeurdacier 2007, Lane and Milesi-Ferretti 2008); exchange rate risk and currency unions (Lane 2006, Coeurdacier and Martin 2009, De Santis and Gerard 2006, Fidora et al. 2007); institutions (Vlachos 2004, Wei and Gelos 2005, Daude and Fratzscher 2008) and corporate governance (Dahlquist et al. 2003) as important determinants of cross-border asset holdings. Controlling for many of these determinants of international portfolios, Coeurdacier and Guibaud (2011) found that investors tend to tilt their foreign holdings towards countries that offer better diversification opportunities.

The second strand of the literature looks at the diverse patterns of foreign capital flows, including topics such as the changing nature of a country's (gross) external positions and the

[1] As a result, financial depth (the ratio of a country's financial assets to GDP) has been increasing consistently across all countries. For example, in 1990–2006, the number of countries whose financial assets' value exceeded that of their respective GDPs increased from 33% to 72% (Farrell et al. 2008).

[2] This includes foreign direct investment, purchases and sales of foreign equities and debt securities, and cross-border lending and deposits.

[3] This collection of studies was originally compiled by Coeurdacier and Guibaud (2011, p. 291).

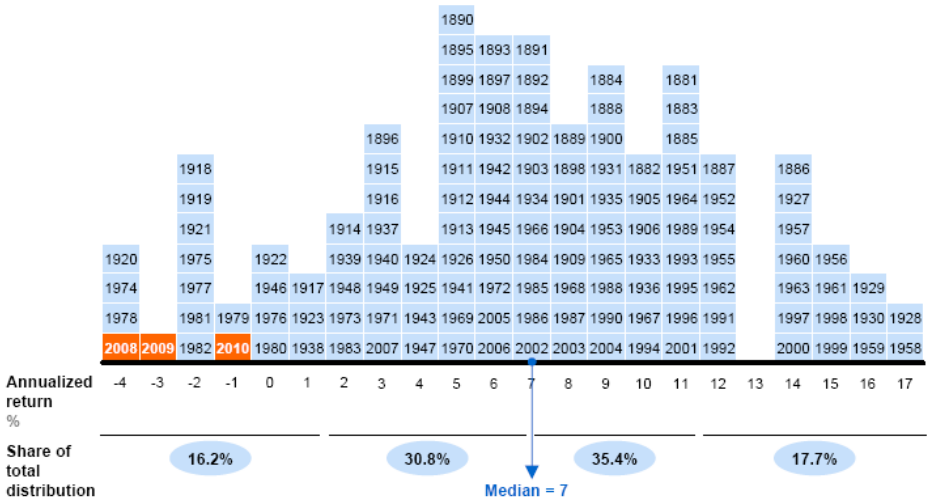
associated composition of international portfolios (Lane and Milesi-Ferretti 2007), portfolio investment as a channel of international risk sharing (Sørensen et al. 2007, Demyanyk et al. 2008, Kose et al. 2009, Bracke and Schmitz 2011, Balli et al. 2011, 2012) and the impact of the recent financial crisis on international diversification (Vermeulen 2013, Balli et al. 2013). In fact, studies on international capital flows have burgeoned so rapidly in recent years that they are collectively referred to today as a completely new branch of literature, namely "Open Economy Financial Macroeconomics" (Coeurdacier and Rey 2011).

However, all the aforementioned studies have one shortcoming in common: they remained silent on the underlying risk affecting cross-border portfolio returns. Risk, captured by the volatility in returns, is one of the two pillars of investors' risk–return profiles underlying their investment decisions. Our goal in this paper is to examine the factors that are likely to be determinants of the earning volatility in cross-border asset holdings.[4] Understanding the (major) sources of earning volatility is crucial if appropriate policy responses are to be framed, especially to minimize the potential welfare costs associated with unstable asset returns. When investment earnings are unpredictable and volatile, so is growth. Although wider swings in the performance of various asset classes create increased profit opportunities for strategies such as macro and convertible arbitrage, these short-term gains should not be traded off for a country's overall financial stability. Across the board, the equity loss from the 2008 stock market crash was so damaging that at the 2008 savings rate, it would take 18 consecutive years for the world's households to amass the lost $28.8 trillion of global wealth (McKinsey Global Institute 2009). Even today, the continuing volatility in the EMU financial markets has kept the spotlight on sovereign debt burdens.

Before progressing to the main analysis of our paper, it is instructive to take a quick detour to examine the recent performance of the United States (US) stock market from a historical perspective. The US remains the world's largest foreign investor, followed by the United Kingdom (UK) and Germany. Figure 1, adopted from McKinsey Global Institute (2011a), plots the distribution of rolling 10-year annualized equity returns over the 1881–2010 period. As this figure shows, the periods ending in 2008, 2009 and 2010 are among the worst for equity returns ever recorded. But also notice the earning volatility during 2000s and how its distribution shifted from above the median return of 7% in the early part of 2000s to two standard deviations away from the median in more recent periods. An almost similar picture was evident in the UK in

[4]Our paper does not focus on the volatility of international capital flows, e.g., sudden reversals of capital flows or sharp declines in inflows.

Figure 1: Distribution of equity returns in the US, 1881–2010



Source: McKinsey Global Institute (2011a). Each block represents the end point of a 10-year period and shows the annualized total real returns to shareholders.

the past decade (c.f. McKinsey Global Institute 2011a). Due to greater financial integration and the resulting increased stock market comovements, the phenomenon of higher volatility is likely to be present in other developed and emerging markets. Employing a range of indicators, we examine the extent and potential determinants of earning volatility across 28 industrialized countries over the past decade.

The plan of the paper is as follows: Section 2 discusses the theory, choice and construction of the variables, as well as the specifications of our empirical models. Section 3 presents our preliminary and main empirical results, while Section 4 presents robustness checks. Section 5 concludes the paper.

2 Theoretical and empirical model specifications

2.1 Theory

Our empirical model is based on a standard multi-factor international capital asset pricing model (ICAPM) which rests on global market integration and requires investors from different countries or sectors to have access to a common set of assets that receive the same price across countries. Implicit to this hypothesis is that the purchasing power parity (PPP) holds, such that the validity of market integration hypothesis is not currency-sensitive. Throughout the paper,

we denominate the asset returns and country-specific components in US dollars.[5]

Suppose there are L countries, where country i has N_i assets, $i = 1, 2, ..., L$.[6] The dollar-denominated return vector for country i is denoted as R_i. Let $N = \sum_{i=1}^{L} N_i$ and $R = [R_1^{'}, R_2^{'}, ..., R_L^{'}]^{'}$ be the $N \times 1$ return vector of all assets in the world. The market integration hypothesis postulates that there is a set (M_{t+1}) of correct global pricing kernels (m_{t+1}) which can price every asset return $(R_{j,t+1})$ in the world market. The specification of the unconditional model can be expressed as:

$$E(m_{t+1}R_{j,t+1}) = p_j, \ \forall t > 0, \forall j = 1, ..., N, \text{ and } \forall m_{t+1} \in M_{t+1}, \tag{1}$$

where p_j is the price for return $R_{j,t+1}$ at time t. Since m_{t+1} is not observable, the international asset pricing models generally use a pricing proxy, y_{t+1}, for m_{t+1}. The linear pricing proxy y_{t+1} can be written as:

$$y_{t+1} = b^{'} F_{t+1} = b_0 + b_1^{'} f_{t+1}, \tag{2}$$

where $F_{t+1} = [1, f_{t+1}]^{'}$ is the $(K+1) \times 1$ global factor vector and $b = [b_0, b_1^{'}]^{'}$ is the $(K+1) \times 1$ global factor price vector. According to this specification, only global factors, F, are priced for assets in the world market, so that these global factors receive the same prices, b, across different countries.

Our main departure from the standard ICAPM model above is that the factors (or determinants) that are used to examine the variations in asset returns are not the traditional Fama and French (1993) global factors (i.e., excess market returns, size, book-to-market equity factors). Rather, as detailed below, our factors are characterized by country-specific components of market integration, financial concentration and investment shares in financial center and across economic sectors. Furthermore, the ICAPM literature considers volatility innovations as a risk factor priced in the cross-section of asset returns, as done by, for instance, Ang et al. (2006). This motivates our approach to investigating the factors that mimic the market volatility. As a final remark, it must be mentioned that the y_{t+1} variable in Equation (2) is not an indicator of market volatility, as defined in Equations (3) and (4). Rather, the model presented above is

[5]When there are deviations from PPP the exchange rate risk constitutes an additional source of risk in influencing the changes in asset prices (Adler and Dumas, 1993). However, in our empirical analysis, the inclusion of the exchange rate volatility measure does not yield statistically significant results.

[6]We follow the notation of Zhang (2006).

only a simple representation of the ICAPM, where market volatility emerges as a significant risk factor (Campbell 1993).[7]

2.2 Data

Since our aim in this paper is to examine the likely determinants of the volatility of returns on cross-border asset holdings, we rely on regression analysis to underpin the determinants empirically. Our annual data cover the years 2001–2009 for a sample of 28 industrialized countries for which we are able to obtain consistent information. See Appendix A for a list of the countries included in our sample. The endpoint is chosen based on the availability of data at the time when we undertook this research. The main sources of our data are the International Monetary Fund's Coordinated Portfolio Investment Surveys (CPIS) database and the Organization for Economic Cooperation and Development (OECD) Annual National Accounts Detailed Tables (Volume II). The CPIS data provide geographical details of cross-border equity and debt holdings based on the residence of the issuer of the securities. The OECD data contain information on the returns on foreign assets (debt and equity). The portfolio returns are simply calculated by summing up equity and debt returns.

2.3 Choice of variables

Our dependent variable is the volatility of cross-border equity/bond returns.[8] Since our empirical analysis involves both panel and cross-section models, we have computed separate dependent variables for each model. For the *panel* model, the dependent variable is computed by taking the absolute value of the change in foreign receipts scaled by total foreign investment:

$$\text{VOL}_{it} = \frac{\text{RECEIPT}_{it}}{\text{TOTAL FOREIGN INVESTMENT}_{it}} - \frac{\text{RECEIPT}_{it-1}}{\text{TOTAL FOREIGN INVESTMENT}_{it-1}} \tag{3}$$

This variable is capable of capturing variations in returns over time, while scaling with total foreign investment control for cross-country heterogeneity among the industrialized countries that constitute our sample. For the *cross-section* model, the dependent variable refers to the

[7] We thank an anonymous referee for pointing out this caveat in our paper.

[8] In the OECD's Annual National Accounts Detailed Tables (Volume II), country-level returns from international equity holdings are reported as the distributed income of corporations, which predominantly includes dividend payments (the distributed income of corporations also includes withdrawals from the income of quasi-corporations), whereas country-level returns on debt holdings include interest payments received on foreign debt investments.

standard deviation (σ) of foreign receipts scaled by total foreign investment:

$$\text{VOL}_i = \frac{\sigma_{\text{RECEIPT}_i}}{\text{TOTAL FOREIGN INVESTMENT}_i} \tag{4}$$

Our independent variables include financial integration, portfolio concentration and a set of control variables encompassing geographic regions as financial centres and economic sectors. First, we employ a conventional measure of financial integration, specifically the sum of portfolio assets and liabilities, scaled by a country's GDP:

$$\text{FI}_{it} = \frac{\text{FA}_{it} + \text{FL}_{it}}{\text{GDP}_{it}}, \tag{5}$$

where FA (FL) denotes the stock of external assets (liabilities).[9] Financial integration is a commonly used indicator in the related literature, mainly to capture the substantial changes in cross-border asset trade by industrial and emerging countries observed in the previous decade. Second, we expect that the concentration (or the degree of diversification) in investments may be an important determinant of the volatility of cross-border asset returns. Typically, securities in a concentrated portfolio are believed to be more "active" and provide better returns to investors. The CPIS data provide sufficient information that can be used to compute standard concentration measures such as the concentration ratio. In general, the n-concentration ratio is the percentage of portfolio allocations in a number (n) of the largest countries and is computed at time t as:

$$\text{CR}_{it} = \frac{\sum_{j=1}^{n} \theta_{ij}}{\text{TFH}_i}, \tag{6}$$

where θ_{ij} is the amount of investment by country i in country j, and TFH_i is the total foreign holdings of country i. We have computed concentration ratios for the top one, three, five and ten largest destination countries. Concentration ratios range from 0 to 1, with small values of this ratio indicating less concentration and vice versa.

Third, the distribution of cross-border investments into distinct groups of countries may affect the volatility of returns. We intend to investigate whether having more foreign investments in countries belonging to a certain group cause less or more volatility in returns. To examine this, CPIS data have been used to obtain the shares of investment in selected groups of

[9]See, Lane and Milesi-Ferretti (2007). The data for GDP are taken from World Bank's World Development Indicators database.

non-overlapping countries, namely OECD countries, emerging market economies (EMEs) and offshore financial centres (OFCs). Fourth, an important feature of the CPIS data is the availability of asset holdings by various economic groups. There are different types of sector within a domestic economy that hold foreign assets, such as banks, non-bank financial institutions (NBFIs), governments and households; each sector has its distinct holding motives, particularly with regards to the degree of risk appetite. Therefore, for the first time in the literature, we include asset holding by different economic sectors as being likely determinants of the volatility of cross-border asset returns. A complete description of the data and related sources is provided in Table 1; Appendix A contains the list of various country classifications used in the analysis.

Our models thus take the following form:

$$\begin{aligned} \text{VOL}_{it} &= \beta_0 + \beta_1 \text{FI}_{it} + \beta_2 \text{CR}_{it} + \beta_3 \text{RS}_{it} + \beta_4 \text{HS}_{it} + \epsilon_{it} \quad \text{(Panel)}, \\ \text{VOL}_{i} &= \beta_0 + \beta_1 \text{FI}_{i} + \beta_2 \text{CR}_{i} + \beta_3 \text{RS}_{i} + \beta_4 \text{HS}_{i} + \epsilon_{i} \quad \text{(Cross-section)}, \end{aligned}$$

where $i = 1, 2, ..., N$ are the indices for countries and $t = 1, 2, ..., T$ refers to time periods. VOL is the dependent variable capturing volatility in the portfolio/equity/debt returns. As discussed earlier, the dependent variable is computed separately for the panel and cross-section models. FI is the measure for financial integration and is calculated as the sum of portfolio assets and liabilities scaled by GDP. CR is the measure of portfolio concentration, indicating the share of investments in the top five largest destination countries. RS is a set of control variables that represent the share of investments in OECD countries, EMEs and OFCs. Further, HS is a second set of control variables that indicate the asset holdings of various sectors of the domestic economy such as banks, NBFIs and households. The panel model is estimated using the pooled method developed by Beck and Katz (1995), which uses panel-corrected standard errors to account for heteroskedasticity, panel autocorrelation and contemporaneous correlation across the units of the panel. However, the cross-section model is estimated using the ordinary least squares technique with White's (1980) heteroskedastic-consistent robust standard errors.

3 Empirical results

3.1 Preliminary results

The data at our disposal allow us to explore some interesting patterns in cross-border portfolios and equity and debt investments for the countries in our sample. Table 2 reports the descriptive statistics of the variables used in panel estimations.[10] As discussed previously, volatility in foreign asset returns is measured as the absolute change in foreign receipts scaled by total foreign investments. This variable has a mean of 0.09, with a maximum value of 1.37 (indicating the highest volatility) and a minimum value of 0.0001 (indicating the lowest volatility). An interesting feature of this indicator is that volatility in equity receipts (0.23) is found to be much higher than that in debt receipts (0.12). Moreover, equity markets are more concentrated than debt markets, as almost 70% of equity investments are confined to the top five countries (on average) compared to 63% for debt markets. From this, it can be inferred that equity returns witnessed more volatility, presumably because of a high level of concentration in comparison to debt markets.

Although concentration ratios have been computed for the top one, three, five and ten largest destination countries, the results presented throughout the paper are based on a concentration ratio for the top five countries due to similarities in the results with alternative concentration measures. For portfolio securities, 62% of investments, on average, are confined to the top five countries, with this value ranging between 40% (minimum) and 98% (maximum). Also, for the entire sample period, unreported results[11] show that portfolio investments by non-EMU OECD countries (about 65%) are more concentrated than those of EMU countries (about 55%).

The indicator for financial integration has a mean of 4.35, indicating that, on average, portfolio assets and liabilities represent 435% of GDP. Such a high value for this indicator is primarily because of the presence of Ireland and Luxembourg in our sample; without them, this ratio stands at merely 117%. At the country level, the financial integration ratio exhibits a maximum value of 97 for Luxembourg (the most integrated country) and a minimum value of 0.07 for Turkey (the least integrated country). The time series trend of this variable shows a considerable surge in international financial integration over the sample period. There is an increase of 116% in portfolio assets and liabilities (as a ratio of GDP) during the period 2001–2009. Even

[10] The results are quite similar to those for the cross-sectional data and are therefore not presented here to conserve space.

[11] These results are available as a supplement upon request.

after excluding Ireland and Luxembourg, the increase in financial integration is a substantial 51%. This increase seems to be largely attributed to debt markets, which witnessed a 42% rise in debt assets and liabilities (as a ratio of GDP) compared to a 12% increase in equity assets and liabilities (as a ratio of GDP) over the sample period.

For the geographical distribution of cross-border portfolio investments, the shares of investments in OECD countries is 42%, followed by 19% for OFCs and 4% for EMEs. An interesting feature is that equity markets in EMEs and OFCs have attracted more than double the share of investments documented in debt markets, implying that from the investors' perspective, the debt instruments offered by this group of countries are not as attractive as the equities.[12] Our data also show considerable intra-regional investments by European countries – a phenomenon known in the literature as 'euro bias'.[13] For instance, about 70% of portfolio investments of EMU countries, on average, are confined within the European region, compared to about 50% of investments by non-EMU OECD countries. In comparative terms, euro bias is more evident in debt markets than in equity markets.

With regards to asset holdings by economic sectors within a domestic economy, NBFIs held 50% of cross-border portfolio assets on average, while banks held 22% and households held 9%. However, the shares of the holdings of these sectors differed considerably between equity and debt markets. Banks tend to be more involved in debt instruments than in equitiess since banking institutions held almost 31% of total debt securities compared to 7% of equity securities. Moreover, as anticipated, the share of equity holdings by mutual funds stood at 30% compared to only 12% of total debt holdings. Similarly, households appear to be more comfortable in holding equity securities (15%) compared to debt securities (8%).

3.2 Core empirical results

Our empirical analysis begins by conducting the unit root test for all series. To this end, we apply the panel unit root test of Im et al. (2003), which does not required a balanced dataset. The results indicate that for most series, the null hypothesis of a unit root is strongly rejected, implying that the series are stationary. In the interests of brevity, the unit root test results are not reported but are available on request.

The estimation results are presented for the dependent variable capturing volatility in cross-

[12] In fact, EMEs compensate investors with higher returns (i.e., a higher equity risk premium) than those observed in developed markets. See Salomons and Grootveld (2003) for related empirical evidence.

[13] See, for example, Balli et al. (2010).

border asset returns (portfolio, equity and debt returns), regressed on two base variables (financial integration and the concentration ratio) and six control variables. As mentioned earlier, these control variables comprise two sets of variables, representing (1) the share of investments in different groups of countries, such as OECD countries, EMEs and OFCs; and (2) the economic sectors of the holders of foreign assets, i.e., banks, NBFIs and households. We also include the control variables separately from our base model to investigate their effect on both the sign and loading of the base explanatory variables.

3.2.1 Panel estimations

Tables 3, 4 and 5 present the panel estimates for portfolio, equity and debt securities, respectively. In all cases, the dependent variable is the volatility in the portfolio/equity/debt returns computed by taking the absolute change in foreign receipts scaled by total foreign investment. Let us begin by interpreting Table 3. We find that a higher level of financial integration is manifested as a reduction in volatility of cross-border portfolio returns (Column 3a), whereas a higher degree of portfolio concentration in a few countries (equivalently, a less diversified portfolio) leads to an increase in the volatility of returns. These findings confirm the basic economic intuitions of portfolio choice theory at the international level (see, for example, Karolyi and Stulz 2003). Furthermore, in a study using data from G7 countries, Bhamra et al. (2012) also documented that return volatility decreases with (greater) financial integration, while return correlation increases. We are not aware of any academic paper supporting our evidence that higher diversification causes lower return volatility using cross-border portfolio data, although our results are in agreement with the predictions of the theoretical models.

Columns 3b to 3g introduce control variables one at a time to our base model (Column 3a) in order to examine their effect on both the sign and loading of the base explanatory variables. As these columns show higher levels of investment in OECD countries and EMEs have opposite effects on the volatility of return on cross-border portfolio holdings. With regard to the EME effect, a likely reason is that the ebb and flow of "hot money" (among other candidate variables) itself is a major source of market volatility in emerging countries. Typically, EME assets "have historically been regarded as inherently risky and particularly vulnerable to international shocks that result in a general increase in investor risk perceptions" (Ammer et al. 2010, p. 1). Not surprisingly, after the collapse of Lehman Brothers in September 2008, EMEs, among other regional groupings, experienced the steepest drop-off in cross-border capital flows including

foreign direct investment, purchases and sales of foreign equities and debt securities, and cross-border lending and deposits (McKinsey Global Institute 2009). Further analysis of EME-specific volatility is given below.

Columns 3e to 3g show the impact of asset holdings by various economic sectors on the volatility of cross-border asset returns. Although the parameter estimates of these indicators are not statistically significant, the inclusion of such variables significantly increases the explanatory power of the full model. In Column 3h, we have included the first set of control variables related to the share of investment in a distinct group of countries along with the two base variables. As can be seen, financial integration, the concentration ratio, OECD countries' share and the EME share stand as the key determinants of the volatility in cross-border asset returns.

Finally, Column 3i presents the full model with both sets of control variables along with the two base indicators. This leads to a considerable increase in the explanatory power, as the values of R^2 increase to 0.85 (from 0.21 for the base model shown in Column 3a). An interesting result that emerges from the full model is that, albeit not statistically significant, a greater share of assets being held by households leads to a reduction of volatility in portfolio returns. A proper interpretation of this result is challenging because household financial behavior has many special features that are not captured by textbook models (Campbell 2006). We will get back to this issue in the discussion of cross-section estimations in the next section. Column 3i also shows that having more assets held in OECD countries is associated with a reduction in volatility in cross-border portfolio returns. This is to be expected, since mature stock markets (as found in OECD countries), by definition, exhibit lower price volatility than their EME counterparts.

Since equity and bond investors look at financial investment very differently, it is instructive to compare how differently the key variables of our model affect the return volatility of the two assets. Tables 4 and 5 report the results for equity and debt assets, respectively. To make things more interesting, we compare the estimates in the two tables simultaneously. An initial remark is that, in general, the magnitude of the estimated parameters is often higher for debt assets and also the debt asset parameters tend to be more statistically significant than their equity counterparts. However, in terms of the explanatory power of the model (indicated by R^2), neither of these models seems to dominate. Interestingly, unlike debt assets, we find that portfolio concentration ratio does not always generate a (statistically) significant effect on the volatility of cross-border equity returns, although the estimated coefficients have the correct sign in all cases. A potential explanation for this empirical result is that in the last decade

(2001–2010), equity markets have endured more volatility and disappointing returns compared to bond markets (see the discussion below). This calls for the need for additional factors to explain the source of the volatility in cross-border asset returns.

As in Table 3, we include a set of geographic variables followed by economic sector variables, one at a time, in the base model. According to Tables 4 and 5, having greater investment shares in EMEs elevated volatility in both equity and debt returns, although the impact was statistically significant for equities only. In the past decade, EMEs' financial stock grew much faster than that of developed countries, thanks to new issuance and stronger earning expectations, as well as increased valuations. For example, of the $387 billion net new equity issuance in 2010, 60% of new issuance occurred in stock exchanges in China and other EMEs (McKinsey Global Institute 2011b). Between 2000 and 2009, the stock of equity and debt in EMEs grew by an average of 18.3% a year, compared with only 5% in developed countries (McKinsey Global Institute 2011b). Moreover, as shown in figure 1 in Ammer et al. (2010), despite the substantial comovement with mature stock markets, the emerging market stock price indices exhibited a relatively more volatile path over the 1992–2009 period. These facts help to explain the larger magnitude of the estimated parameters associated with the EME share (compared to the OECD share) in explaining the volatility in cross-border asset returns. Moreover, while a higher OECD share leads to a reduction in the volatility of debt asset returns, it elevates the volatility of cross-border equity asset returns (albeit with a statistically insignificant effect). The former result may have been driven by the formation of the EMU, which resulted in a dramatic convergence of bond yields (and hence a lower yield variation) among the EMU member countries.[14]

To date, we have little understanding of the activities of OFCs and their linkages with other financial centres. Although OFCs are not typically the ultimate source or final destination for cross-border investments, data compiled recently by Lane and Milesi-Ferretti (2010) show strong financial interconnections between OFCs and advanced economies.[15] Our results indicate that greater participation by OFCs depresses (elevates) volatility in cross-border equity (bond) returns. This asymmetric effect is possibly driven by the time-varying share of the global portfolio, equity and debt assets invested in OFCs. As reported by Lane and Milesi-Ferretti (2010), OFCs' portfolio equity share has climbed from just under 6% to over 9% during 2001–

[14] See, among others, Balli et al. (2010) for the related empirical evidence.

[15] As stated in Lane and Milesi-Ferretti (2010), according to a 2008 report by the US Government Accountability Office, about 732 companies trading in the US stock exchanges are incorporated in the Cayman Islands – a Caribbean island that is home to nearly three-quarters of all OFC financial transactions. Gonzalez and Schipke (2011) report that against the combined $8 trillion worth of cross-border assets and liabilities held by the US, Germany and France in 2009, the OFCs held assets and liabilities worth some $5 trillion.

2007, whereas the portfolio debt share has remained relatively stable in the 5–6% range.

Among the three economic sectors, banks and NBFIs exert a statistically significant effect only on the volatility of cross-border debt asset returns. Unlike banks, NBFIs do not face stringent capital and liquidity requirements, which may affect global liquidity conditions in ways that are largely beyond the scope of regulatory policies (see Bank of International Settlements 2011). Our results show that a higher NBFI share leads to an elevation of volatility in equity returns, but dampens volatility for debt returns (see Column f in Tables 4 and 5). This asymmetry in risk exposure is consistent with NBFIs increasing their reliance on short-term debt instruments,[16] since by choosing short-term contracts, NBFIs keep the option to pull out quickly in the face of a market crash. In contrast to the case of the portfolio assets, a higher household share in a country elevates volatility in both equity and debt returns, although none of the effects were statistically significant.

Finally, in Tables 4 and 5, Columns h and i show the results with, respectively, one and two sets of control variables added to the base model. Our first remark is that volatility in equity returns appears to be best explained by the model containing only the geographic variables, whereas both geographic and economic sector controls are useful in explaining the volatility of debt returns. The results show that after accounting for the level of financial integration and portfolio concentration, only the EME share appears as the leading determinant of (higher) volatility in cross-border equity returns. By comparison, an array of factors account for the observed volatility in the cross-border debt returns. As Column i in Table 5 shows, except for financial integration and household shares, all other variables stand as statistically significant determinants of debt–return volatility, albeit in different forms and magnitudes.

What could explain the difference in the degree of various determinants to explain the volatility in cross-border equity and bond returns? During most of the first decade of the 21st century, the equity and debt markets in developed countries behaved very differently. In the euro area, for instance, the creation of the single currency has led to the remarkable convergence in bond yields (both corporate and sovereign) and the associated reduction in volatility (Balli et al. 2010), whereas such integration seems to have been limited in the euro area's equity markets, relative to its bond markets (Bekaert et al. 2011). In the unravelling of the recent global crisis, although both global equity and bond markets have suffered a clear setback, much of the damage

[16]For example, in Ireland, NBFIs accounted for more than half of total bank credit in 2008. Although the total bank credit extended to NBFIs in the US and the euro area has levelled off since the start of the crisis in 2007, credit grew strongly in the years prior to the crisis. See graph 5 in Bank of International Settlements (2011, p. 19).

has been witnessed in global equity markets (see McKinsey Global Institute 2009). Both in the UK and the US, the past decade has produced some of the worst real 10-year equity returns in more than a century. As shown in Figure 1, the 10-year S&P composite index rolling returns stand at –4% and –3%, respectively, for 2008 and 2009; a rare occurrence in 130 years of US stock market history. Furthermore, measuring volatility by the number of days per year that the daily price change exceeded 3%, daily price movements on exchanges across Europe and the US appear to have been more volatile during 2000s, compared to during the 1990s and 1980s.[17] The severe decline in the global value of equity assets has partly been compensated by increased new issuance of debt securities (both private and government), as well as an acceleration in bank deposits, reflecting both a flight to safety by depositors and aggressive efforts by banks to attract deposits.

It is always a difficult task to explain capital market movements. In our conjecture, the confluence of many factors, including the ones used here and those not observed (e.g., policy and behavioral factors), contributed to the dramatic rise and the subsequent fall in financial globalization (measured by cross-border capital flows) in the past ten years; these factors are directly attributable to the changing volatility in equity and bond returns.

3.2.2 Cross-section estimations

We now turn to the cross-sectional implications of our empirical model for the determinants of the volatility of cross-border equity and debt returns in OECD countries. Tables 6, 7 and 8 present cross-section estimates for portfolio, equity and debt securities, respectively. As before, the dependent variable is the volatility in the portfolio/equity/debt returns, but, in this case, it is calculated as the standard deviation of returns scaled by total foreign investments. Furthermore, the cross-section regression uses time-averaged data to estimate the parameters, thus providing a long-run perspective of the determinants of the volatility in cross-border asset returns.

Examining the results in Tables 6–8, we notice that, in most cases, while the signs of the estimated cross-section parameters are in the same direction as those of the estimated panel parameters, the magnitude of the estimated parameters of the former is higher than those of the latter.[18] This is possibly due to the failure to adjust for potential parameter heterogeneity, which is expected in a cross-country context. Nevertheless, when using cross-section regressions

[17] See exhibit 19 in McKinsey Global Institute (2011a) for a graphical illustration.

[18] This upward bias of cross-sectional estimates or the downward bias of panel estimates is not uncommon in empirical research. See, among others, Freeman (1984) and Krol (1996) for evidence of varying estimates created by estimation techniques.

of time-averaged data, Phillips and Moon (1999) showed that both the pooled least squares regression and the fixed effects regression provided consistent estimates of this long-run average relationship. This is because the relations are parameterized in terms of the matrix regression coefficients of the long-run average covariance matrix for the cross-section, instead of using covariance matrix for the data (as used in conventional regressions). We therefore follow Phillips and Moon (1999) and interpret the estimated coefficients as average cross-country long-run effects.

Nevertheless, although it would be difficult to interpret the estimates unambiguously, the cross-section results are suggestive of the negative (positive) impact of financial integration (concentration ratio) on the volatility of cross-border asset returns (Table 6). The results of the remaining models reported in Table 6 are somewhat similar to their panel counterparts (Table 3), albeit with vastly different coefficient estimates. Crucially, for the full model (Column 6i), the cross-section estimates also suggest that a higher portfolio share in EMEs (by households) elevates (dampens) the volatility of the cross-border asset returns. The EME–volatility nexus has already been discussed, so let us interpret the results of the household sector as a major determinant of the earning volatility.

The finding that a higher (portfolio) share by households has a long-term negative impact on the volatility of returns is both appealing and puzzling. It is appealing, because it emphasizes the crucial role that households' portfolio holdings play in reducing overall market volatility. Not only the amount invested by households, but also its composition of equity and debt seems important. As shown by Column i in Tables 7 and 8, the long-run effect of volatility reduction is greater when households hold more equity securities than debt securities. It is worth mentioning here that both in the US and Western Europe, households place a larger share of their financial assets in equities than fixed-income securities (McKinsey Global Institute 2011a).[19] On the other hand, the puzzling side of this result is that it appears unconvincing, with the findings of a large body of empirical evidence suggesting that, in general, household portfolios are poorly diversified, with many people reporting substantial holdings of a single stock – see Campbell (2006) for a survey of the evidence on household portfolio choice. Nevertheless, the observed reduction in volatility through greater household participation can be interpreted as the natural

[19]By comparison, investors in EMEs keep most of their assets in bank deposits or physical assets (such as real estates and gold), which reflects lower income levels, underdeveloped financial markets and other barriers to diversification (see McKinsey Global Institute (2011a) for further discussion). Nevertheless, our preliminary results suggest that households hold almost twice as large a share of equity securities (15%) as they do debt securities (8%).

outcome of greater risk-sharing facilitated by increased integration.

Summing up, our analysis has brought to light a number of key determinants that influence the volatility of cross-border asset returns. Among the factors that explain the elevation in volatility are (rising) portfolio concentration and a greater share of asset holdings in EMEs. In contrast, more financial integration and a greater share in OECD countries and by the household sector cause a reduction in the volatility. Larger asset holdings in OFCs and by NBFIs increase overall market volatility, although they affect the volatility in equity and bond markets in the opposite way. Overall, both the cross-sectional and panel estimates provide somewhat similar results, leading us to conclude that results obtained in this study are indeed robust.

4 Robustness: Addressing endogeneity bias

In this section, we check the robustness of the above analysis allowing for potential endogeneity in the relationship between volatility in asset returns and its determinants. Endogeneity may arise because the foreign receipts to total foreign investment (FR/TFI) ratio (i.e., the dependent variable) and the level of financial integration (portfolio concentration between countries) are jointly determined in equilibrium. In other words, while more financial integration or concentration may influence the volatility in asset returns, there may also be a reverse causality running from the former to the latter. In fact, both Granger's (1969) causality and Geweke's (1982) measure of instantaneous feedback[20] tests confirm the existence of a bidirectional causality between changes in the FR/TFI ratio and portfolio concentration for portfolio, equity and debt assets.[21] However, no such bidirectional causal relationship is found between changes in the FR/TFI ratio and the level of financial integration.

To deal with the endogeneity problem, we make use of an instrumental variable that is related to financial concentration but does not lead to change in the dependent variable (i.e., the

[20]Unlike Granger's (1969) causality test, which tests whether lags in one variable can be used to predict the current values of another variable, Geweke's (1982) measure, calculated from the residuals of standard Granger causality tests, provides the instantaneous (or contemporaneous) feedback between pairs of variables. The latter test is desirable in situations where the data are measured infrequently (e.g., yearly) and the causality is instantaneous. See Dicle and Levendis (2013) for further discussion.

[21]For portfolio assets, the estimation reveals that changes in the FR/TFI ratio Granger-cause portfolio concentration changes (p-value: 0.028). There is evidence of instantaneous feedback between the two variables, as reported by Geweke's measure (p-value: 0.047). For equity assets, while changes in financial concentration Granger-cause changes in the FR/TFI ratio, the reverse is not the case. However, Geweke's measure reveals evidence of instantaneous feedback between the two variables (p-value: 0.110). Moreover, the total correlation between the two variables is highly statistically significant (p-value: 0.005). Finally, for debt assets, although changes in the FR/TFI ratio does not Granger-cause changes in financial concentration (p-value: 0.313), both Geweke's measure and total correlation reveal a strong linear association between the two variables (p-values: 0.010 and 0.002, respectively). Overall, the above estimation results reveal an empirically acceptable level of causation (both lagged and instantaneous) between the variables under examination.

FR/TFI ratio) aside from the indirect route via financial concentration. Our chosen instrument is a measure of "trade concentration", since it is very likely that bilateral trade in goods is a powerful determinant of bilateral asset holdings between countries. The economic rationale that provides the bridge between trade in goods and asset holdings is based on information symmetries, which states that trading in the goods market reduces informational asymmetries in the financial markets, thus helping investors' financing investment plans in foreign markets.[22] Since our objective is to find a suitable instrument for the concentration ratio for the top five countries, for each country, we construct the trade concentration measure by mapping the trade shares of the five countries that enter into the calculation of the financial concentration ratio. Thus, for the US (to provide an example), the top five destinations where the US investors are most likely to invest also appear in the calculation of the trade concentration ratio to capture the strong relationship between trade flows and cross-border asset flows. The trade concentration ratios are constructed using bilateral 'exports' and 'total trade' shares, and the shares are chosen using two different schemes: (i) the contemporaneous (current period) shares and (ii) a three-year moving average of the current year and the previous two years of trade shares. As a result, we have four alternative measures of trade concentration ratios for each country as possible instruments of the financial concentration ratio.

Table 9 presents the correlation coefficients between the financial concentration ratio and four alternative trade concentration ratios for each country in the sample. We find that for the majority of countries with large financial markets (such as the US, the UK, Germany, Japan, France and the Netherlands), the correlation coefficients are positive and highly statistically significant, complementing the strong relationship between trade flows and cross-border capital flows discussed above. The opposite sign for the correlation coefficients between trade flows and cross-border capital flows in some countries could be the result of return-chasing behavior and portfolio diversification in response to negative domestic macro-news in host countries. Overall, the estimated correlation coefficients provide support for the hypothesis that the trade concentration ratio can be used as a relevant instrument for the cross-border financial concentration ratio to deal with the endogeneity problem discussed above.

Table 10 presents the generalized method of moments estimation of the instrumental variable regressions for both the panel and cross-section models by the class of assets (portfolio, equity and debt). For brevity, we only present the results of the full model for each asset class. Several

[22] Aviat and Coeurdacier (2007) report that a 10% increase in bilateral trade raises bilateral asset holdings by 6% to 7%. The reverse causality is also significant, albeit smaller (2.5%).

remarks are in order. First, except for equity assets, the null hypothesis of a weak instrument is rejected for both portfolio and debt assets (as indicated by the very low p-values of the F-test), suggesting that the trade concentration ratio is a valid instrument for the panel and cross-section equations. The relatively lower level of statistical significance seen for the instrument for equity assets, particularly for the cross-section model, is consistent with the weak causality between the FR/TFI ratio and the financial concentration ratio detected with the Granger causality test (see Footnote 19). Second, the estimated coefficients of the instrumented variables (i.e., the trade concentration ratio) in the first-stage regression are positive and statistically significant in majority of the cases, consistent with the core empirical findings discussed above.[23] Third, in all cases but one, the instrument constructed using the three-year moving average of export shares provides the best estimation results presented in Table 10. This suggests to us that improvements in goods trade integration positively affects cross-border asset trade. Fourth, we see that the coefficients of the financial concentration ratio are less precisely estimated in both the panel and cross-section models, as indicated by the changing of the parameter sign across asset classes and the lack of statistical significance of the parameters. However, instrumenting appears to support the results that more financial integration (an increase in asset holdings in EMEs) leads to a reduction (elevation) of the volatility of the returns from cross-border asset holdings. Moreover, instrumenting appears to increase the effects of banks on the volatility of the return from debt assets. Although they are subject to a number of caveats, the overall findings of the instrumental variable regressions are supportive of the core model presented above, suggesting that our core results are robust to the endogeneity problem.

5 Concluding remarks

In this paper, an attempt is made to understand the likely determinants of the volatility of cross-border asset returns. Given that over the past decade, EME financial assets grew more robustly than those in mature economies, and given that (future) global wealth is shifting to EMEs due to aging populations[24] in developed economies, our finding that a greater share of assets invested in EMEs is associated with higher earning volatility has important implications for policy decisions. These include strengthening the legal and regulatory foundations to improve

[23]For the sake of brevity, we do not report the estimated coefficients of the remaining instruments included in the first-stage regression, but they are available from the corresponding author on request.

[24]In addition, forces such as a growing interest in alternative investments, the move to defined-contribution pension schemes and new financial regulations in mature economies will shape the pronounced rebalancing of global financial assets in the coming decade. See McKinsey Global Institute (2011a) for further discussion.

the financial transparency of stock markets in EMEs. As emphasized by our results that higher asset holdings in mature economies lead to a reduction in volatility, an improvement in the conditions for investments in EMEs, therefore, would be the right step towards managing and mitigating the risks in global capital markets.

Furthermore, in view of the finding of a negative association between households' investments and market volatility, policies to facilitate households to have a better access to equity markets could help lessen the volatility. Like institutional investors, households have long time horizons and can provide "patient capital" to the market, as well as volume and liquidity. While our results point to (greater) financial integration as a dampening factor influencing earning volatility, despite the globalization of capital markets achieved so far, investors in mature economies have been slow to diversify their portfolios internationally (i.e., they have a higher "home bias").[25] To encourage global capital flows, policy-makers in both mature and developing economies should implement appropriate measures[26] to discourage home bias.

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[25] See Table 1 in Balli et al. (2011) for the extent of home bias reduction in selected OECD countries over the 1997–2007 period

[26] Some relevant measures, as suggested by McKinsey Global Institute (2011a, p. 59), include, (i) removing any limits on the amount that households and pension funds can invest in foreign markets, (ii) creating mutual funds and other vehicles that will enable EME investors to purchase foreign securities, (iii) ensuring that appropriate currency hedging instruments are widely available and cost-effective, and (iv) increasing the financial education of consumers.

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Appendix A: List of countries

Sample countries: Austria, Belgium, Chile, Czech Republic, Denmark, Estonia, Finland, France, Germany, Greece, Hungary, Ireland, Israel, Italy, Japan, Republic of Korea, Luxembourg, Mexico, Netherlands, Norway, Poland, Portugal, Slovak Republic, Spain, Sweden, Switzerland, United Kingdom and United States.

OECD countries (OECD): Australia, Austria, Belgium, Canada, Denmark, Estonia, Finland, France, Germany, Greece, Iceland, Israel, Italy, Japan, New Zealand, Norway, Portugal, Slovak Republic, Slovenia, Spain, Sweden, United Kingdom and United States.

Emerging market economies (EMEs): Brazil, Chile, China, Czech Republic, Egypt, Hungary, India, Indonesia, Republic of Korea, Malaysia, Mexico, Morocco, Peru, Philippines, Poland, Russian Federation, South Africa, Taiwan, Thailand and Turkey.

Offshore financial centers (OFCs): Andorra, Anguilla, Antigua and Barbuda, Aruba, The Bahamas, Bahrain, Barbados, Belize, Bermuda, Cayman Islands, Cook Islands, Costa Rica, Cyprus, Dominica, Gibraltar, Grenada, Guernsey, Hong Kong, Ireland, Isle of Man, Jersey, Lebanon, Liechtenstein, Luxembourg, Macao, Malta, Marshall Islands, Nauru, Netherlands Antilles, Niue, Palau, Panama, St. Kittis and Nevis, St. Lucia, St. Vincent and the Grenadines, Samoa, Seychelles, Singapore, Switzerland, Turks and Caicos Islands, Vanuatu and British Virgin Islands.

Table 1. Data description

Variable	Description	Source
VOL (panel)	Absolute change in foreign receipts scaled by total foreign investments	OECD & authors' calculations
VOL (cross-section)	Standard deviation of foreign receipts scaled by total foreign investments	-do-
FI	Sum of foreign portfolio assets & liabilities scaled by GDP	CPIS (IMF) & authors' calculations
CR	Portfolio concentration ratio	CPIS (IMF) & authors' calculations
GDP	Gross domestic product	WDI, World Bank
Exchange rate	National currency per US$	OECD
Geographic control variables		
OECD	OECD countries	CPIS (IMF) & authors' calculation
EMEs	Emerging market economies	-do-
OFCs	Offshore financial centers	-do-
Economic sector control variables		
Banks	Asset holdings by commercials banks	CPIS (IMF) & authors' calculation
NBFIs	Assets holdings by non-bank financial institutions	-do-
Households	Assets holdings by households	-do-

Note: OECD (OECD's Annual National Accounts Detailed Tables (Volume II)); IMF (International Monetary Fund); CPIS (Coordinated Portfolio Investment Surveys); WDI (World Development Indicator).

Table 2: Descriptive statistics for panel estimation

Variable	Mean	Median	Max.	Min.	Std. Dev.	Obs.
A. Portfolio Securities						
Receipt to investment ratio (absolute Δ)	0.092	0.022	1.375	0.000	0.206	231
Financial integration	4.353	1.220	97.886	0.076	14.887	250
Portfolio concentration ratio	0.622	0.595	0.981	0.405	0.112	250
OECD countries' share	0.644	0.640	0.908	0.301	0.125	250
Emerging markets' share	0.048	0.031	0.254	0.001	0.049	247
Offshore financial centers' share	0.195	0.179	0.654	0.031	0.106	250
Banks' share	0.221	0.203	0.544	0.004	0.132	164
Non-bank financial institutions' share	0.504	0.519	0.988	0.087	0.188	151
Households' share	0.099	0.060	0.419	0.000	0.103	94
B. Equity Securities						
Receipt to investment ratio (absolute Δ)	0.238	0.029	5.261	0.000	0.649	234
Financial integration	4.353	1.220	97.886	0.076	14.887	250
Portfolio concentration	0.702	0.691	1.000	0.060	0.131	250
OECD countries' share	0.558	0.570	0.933	0.059	0.177	250
Emerging markets' share	0.074	0.044	0.819	0.001	0.097	242
Offshore financial centers' share	0.306	0.265	0.762	0.039	0.173	249
Banks' share	0.078	0.045	0.726	0.000	0.113	143
Non-bank financial institutions' share	0.626	0.633	1.000	0.112	0.233	144
Households' share	0.157	0.122	0.490	0.003	0.128	87
C. Debt Securities						
Receipt to investment ratio (absolute Δ)	0.123	0.027	2.014	0.000	0.299	238
Financial integration	4.353	1.220	97.886	0.076	14.887	250
Portfolio concentration	0.637	0.614	1.000	0.440	0.107	250
OECD countries' share	0.701	0.696	0.941	0.225	0.123	248
Emerging markets' share	0.034	0.024	0.346	0.000	0.037	241
Offshore financial centers' share	0.125	0.112	0.762	0.007	0.088	250
Banks' share	0.311	0.294	0.856	0.004	0.179	155
Non-bank financial institutions' share	0.415	0.445	0.920	0.000	0.200	142
Households' share	0.081	0.029	0.547	0.002	0.110	86

Note: This table reports the descriptive statistics of variables used in panel estimations for a sample of 28 industrialized countries for the years 2001-2009. The variables include; receipt to investment ratio (absolute change) represent the absolute value of the change in receipts to investment ratio (i.e. receipts to investment ratio (t) - receipts to investment ratio (t-1)); financial integration is foreign portfolio investments and liabilities to GDP ratio; concentration ratio is the share of investment in five largest destination countries; OECD countries' share, emerging markets' share and offshore financial centres' share are the shares of foreign portfolio investments made in the mentioned groups of countries; and, banks' share, non-bank financial institutions' share, and households' share represent the shares of portfolio holdings by these sectors of source countries.

Table 3: Factors explaining volatility in returns on portfolio securities (panel estimations)

	(3a)	(3b)	(3c)	(3d)	(3e)	(3f)	(3g)	(3h)	(3i)
Financial integration	-0.0014***	-0.0006	-0.0017***	-0.0012**	-0.072***	-0.080**	-0.121**	-0.0007*	-0.045
	(0.0004)	(0.0004)	(0.0004)	(0.0004)	(0.026)	(0.031)	(0.052)	(0.0004)	(0.038)
Portfolio concentration	0.273***	0.707***	0.144***	0.263***	0.334**	0.218**	0.604***	0.846***	1.349**
	(0.049)	(0.171)	(0.046)	(0.077)	(0.131)	(0.085)	(0.218)	(0.231)	(0.546)
OECD countries' share		-0.460***						-0.574***	-1.136*
		(0.150)						(0.186)	(0.598)
Emerging markets' share			0.897***					0.798**	3.343***
			(0.318)					(0.388)	(0.915)
Offshore financial centres' share				0.024				-0.261	-0.518
				(0.238)				(0.212)	(0.569)
Banks' share					-0.042				0.141
					(0.156)				(0.309)
Non-bank financial institutions' share						0.191			0.153
						(0.160)			(0.269)
Households' share							-0.546		-0.393
							(0.561)		(0.533)
Observations	231	231	229	231	152	140	90	229	90
R^2	0.217	0.281	0.234	0.212	0.161	0.217	0.272	0.294	0.850

Note: The dependent variable is the volatility in cross-border portfolio returns (computed by taking the absolute change in the portfolio receipts to investment ratio) for a sample of 28 industrialized countries for the period 2001–2009. Financial integration is measured as the ratio of foreign portfolio investments and liabilities to GDP; portfolio concentration is the percentage share of investments in the five largest destination countries; OECD countries' share, emerging markets' share and offshore financial centres' share reflect the percentage shares of foreign portfolio investments made in that particular group of non-overlapping countries. Banks' share, non-bank financial institutions' share and households' share represent the percentage shares of portfolio holdings by these sectors in the sample countries. Heteroskedasticity corrected standard errors are shown in parentheses. ***, ** and * denote statistical significance at the 1%, 5% and 10% levels, respectively.

Table 4: Factors explaining volatility in returns on equity securities (panel estimations)

	(4a)	(4b)	(4c)	(4d)	(4e)	(4f)	(4g)	(4h)	(4i)
Financial integration	-0.002*	-0.002	-0.006***	-0.004**	-0.077**	-0.264*	-0.075	-0.004**	-0.139***
	(0.001)	(0.002)	(0.001)	(0.002)	(0.034)	(0.139)	(0.054)	(0.002)	(0.043)
Portfolio concentration	0.816***	-0.800*	0.549***	1.469***	0.319**	0.280	0.322	1.487**	0.171
	(0.212)	(0.438)	(0.166)	(0.461)	(0.125)	(0.181)	(0.219)	(0.758)	(0.316)
OECD countries' share		0.148						-0.603	0.026
		(0.585)						(0.623)	(0.311)
Emerging markets' share			1.639**					0.990	5.308***
			(0.760)					(0.741)	(0.563)
Offshore financial centres' share				-1.369**				-0.992	-0.042
				(0.654)				(0.718)	(0.299)
Banks' share					-0.093				0.175
					(0.190)				(0.266)
Non-bank financial institutions' share						0.686			-0.215
						(0.483)			(0.199)
Households' share							0.104		0.102
							(0.355)		(0.207)
Observations	234	234	228	233	136	135	85	227	79
R^2	0.200	0.218	0.267	0.250	0.130	0.285	0.098	0.346	0.903

Note: The dependent variable is the volatility in cross-border portfolio returns (computed by taking the absolute change in the portfolio receipts to investment ratio) for a sample of 28 industrialized countries for the period 2001–2009. Financial integration is measured as the ratio of foreign portfolio investments and liabilities to GDP; portfolio concentration is the percentage share of investments in the five largest destination countries; OECD countries' share, emerging markets' share and offshore financial centres' share reflect the percentage shares of foreign portfolio investments made in that particular group of non-overlapping countries. Banks' share, non-bank financial institutions' share and households' share represent the percentage shares of portfolio holdings by these sectors in the sample countries. Heteroskedasticity corrected standard errors are shown in parentheses. ***, ** and * denote statistical significance at the 1%, 5% and 10% levels, respectively.

Table 5: Factors explaining volatility in returns on debt securities (panel estimations)

	(5a)	(5b)	(5c)	(5d)	(5e)	(5f)	(5g)	(5h)	(5i)
Financial integration	-0.0019***	-0.00003	-0.0015***	-0.0016**	-0.159***	-0.085**	-0.140*	-0.0001	-0.072
	(0.0005)	(0.00006)	(0.0004)	(0.0005)	(0.044)	(0.039)	(0.079)	(0.0005)	(0.045)
Portfolio concentration	0.325***	1.195***	0.164***	0.212**	0.368***	0.718***	0.533*	1.167***	1.860***
	(0.063)	(0.263)	(0.062)	(0.083)	(0.132)	(0.159)	(0.279)	(0.373)	(0.641)
OECD countries' share		-0.880***						-0.851***	-0.985*
		(0.235)						(0.279)	(0.508)
Emerging markets' share			1.124					0.356	7.142***
			(0.752)					(0.779)	(1.898)
Offshore financial centres' share				0.673				-0.301	-2.476**
				(0.421)				(0.324)	(1.212)
Banks' share					0.410*				0.688**
					(0.241)				(0.296)
Non-bank financial institutions' share						-0.444**			-0.693***
						(0.196)			(0.238)
Households' share							0.182		0.724
							(1.102))		(0.485)
Observations	238	237	230	238	147	135	84	230	83
R^2	0.212	0.365	0.158	0.240	0.352	0.357	0.105	0.248	0.850

Note: The dependent variable is the volatility in cross-border portfolio returns (computed by taking the absolute change in the portfolio receipts to investment ratio) for a sample of 28 industrialized countries for the period 2001–2009. Financial integration is measured as the ratio of foreign portfolio investments and liabilities to GDP; portfolio concentration is the percentage share of investments in the five largest destination countries; OECD countries' share, emerging markets' share and offshore financial centres' share reflect the percentage shares of foreign portfolio investments made in that particular group of non-overlapping countries. Banks' share, non-bank financial institutions' share and households' share represent the percentage shares of portfolio holdings by these sectors in the sample countries. Heteroskedasticity corrected standard errors are shown in parentheses. ***, ** and * denote statistical significance at the 1%, 5% and 10% levels, respectively.

Table 6: Factors explaining volatility in returns on portfolio securities (cross-section estimations)

	(6a)	(6b)	(6c)	(6d)	(6e)	(6f)	(6g)	(6h)	(6i)
Financial integration	-0.0017*	-0.0014*	-0.0022**	-0.0014	-0.152	-0.175	-0.219*	-0.0025**	-0.085*
	(0.0009)	(0.0008)	(0.0009)	(0.0009)	(0.101)	(0.115)	(0.118)	(0.0010)	(0.042)
Portfolio concentration	0.877**	1.142*	0.932	0.869*	0.547	0.396	1.114	1.427**	2.865**
	(0.401)	(0.676)	(0.565)	(0.434)	(0.477)	(0.549)	(1.497)	(0.640)	(0.781)
OECD countries' share		-0.290						-0.508	-0.674
		(0.380)						(0.323)	(0.368)
Emerging markets' share			2.993*					3.263*	6.340***
			(1.714)					(1.624)	(1.717)
Offshore financial centres' share				0.203				-0.621	1.312
				(0.636)				(0.595)	(0.951)
Banks' share					0.145				-0.402
					(0.363)				(0.419)
Non-bank financial institutions' share						0.218			-0.321
						(0.426)			(0.318)
Households' share							-0.448		-1.593**
							(0.551)		(0.538)
Observations	28	28	28	28	20	20	15	28	15
R^2	0.136	0.156	0.347	0.141	0.268	0.277	0.350	0.386	0.924

Note: The dependent variable is the standard deviation of portfolio receipts (scaled by the investment ratio) for a sample of 28 industrialized countries for the period 2001–2009. Financial integration is measured as the ratio of foreign portfolio investments and liabilities to GDP; portfolio concentration is the percentage share of investments in the five largest destination countries; OECD countries' share, emerging markets' share and offshore financial centres' share reflect the percentage shares of foreign portfolio investments made in that particular group of non-overlapping countries. Banks' share, non-bank financial institutions' share and households' share represent the percentage shares of portfolio holdings by these sectors in the sample countries. Heteroskedasticity consistent standard errors are given in parentheses. ***, ** and * denote statistical significance at the 1%, 5% and 10% levels, respectively.

Table 7: Factors explaining volatility in returns on equity securities (cross-section estimations)

	(7a)	(7b)	(7c)	(7d)	(7e)	(7f)	(7g)	(7h)	(7i)
Financial integration	-0.006	-0.005	-0.007	-0.006	-0.201	-0.242	-0.248	-0.008	-0.103
	(0.006)	(0.005)	(0.005)	(0.005)	(0.206)	(0.173)	(0.278)	(0.005)	(0.145)
Portfolio concentration	0.552	0.552	1.090	0.727	-0.479	1.084	0.127	2.574	2.225
	(1.864)	(1.969)	(1.852)	(2.207)	(0.870)	(1.418)	(1.211)	(1.715)	(1.324)
OECD countries' share		-0.840						-2.792	0.181
		(1.080)						(2.469)	(1.084)
Emerging markets' share			5.669***					4.478**	10.269*
			(1.563)					(1.777)	(4.251)
Offshore financial centres' share				-0.349				-3.200	0.939
				(0.943)				(2.518)	(1.326)
Banks' share					-0.505				-1.134
					(0.924)				(0.850)
Non-bank financial institutions' share						0.974*			0.011
						(0.562)			(0.511)
Households' share							-0.479		-0.854
							(0.604)		(1.037)
Observations	28	28	28	28	18	19	14	28	14
R^2	0.022	0.055	0.235	0.025	0.143	0.427	0.179	0.330	0.879

Note: The dependent variable is the standard deviation of portfolio receipts (scaled by the investment ratio) for a sample of 28 industrialized countries for the period 2001–2009. Financial integration is measured as the ratio of foreign portfolio investments and liabilities to GDP; portfolio concentration is the percentage share of investments in the five largest destination countries; OECD countries' share, emerging markets' share and offshore financial centres' share reflect the percentage shares of foreign portfolio investments made in that particular group of non-overlapping countries. Banks' share, non-bank financial institutions' share and households' share represent the percentage shares of portfolio holdings by these sectors in the sample countries. Heteroskedasticity consistent standard errors are given in parentheses. ***, ** and * denote statistical significance at the 1%, 5% and 10% levels, respectively.

Table 8: Factors explaining volatility in returns on debt securities (cross-section estimations)

	(8a)	(8b)	(8c)	(8d)	(8e)	(8f)	(8g)	(8h)	(8i)
Financial integration	-0.0018*	-0.0016	-0.0016**	-0.0011	-0.131*	-0.104	-0.112	-0.0010	-0.094
	(0.0010)	(0.0009)	(0.0006)	(0.0009)	(0.072)	(0.073)	(0.117)	(-0.0007)	(-0.077)
Portfolio concentration	1.361***	1.750***	1.176***	1.274***	1.355***	1.197***	0.808	1.571***	2.909
	(0.363)	(0.508)	(0.415)	(0.248)	(0.179)	(0.256)	(1.143)	(0.440)	(1.544)
OECD countries' share		-0.349						-0.405	-0.682
		(0.287)						(0.308)	(0.435)
Emerging markets' share			3.915*					3.993*	7.653
			(2.275)					(2.299)	(4.007)
Offshore financial centres' share				0.734				0.440	-0.395
				(0.442)				(0.478)	(2.823)
Banks' share					0.568***				0.352
					(0.167)				(0.548)
Non-bank financial institutions' share						-0.402			-0.598
						(0.270)			(0.450)
Households' share							1.016		0.072
							(1.658)		(0.818)
Observations	28	28	28	28	19	19	13	28	13
R^2	0.272	0.296	0.441	0.312	0.534	0.481	0.334	0.497	0.828

Note: The dependent variable is the standard deviation of portfolio receipts (scaled by the investment ratio) for a sample of 28 industrialized countries for the period 2001–2009. Financial integration is measured as the ratio of foreign portfolio investments and liabilities to GDP; portfolio concentration is the percentage share of investments in the five largest destination countries; OECD countries' share, emerging markets' share and offshore financial centres' share reflect the percentage shares of foreign portfolio investments made in that particular group of non-overlapping countries. Banks' share, non-bank financial institutions' share and households' share represent the percentage shares of portfolio holdings by these sectors in the sample countries. Heteroskedasticity consistent standard errors are given in parentheses. ***, ** and * denote statistical significance at the 1%, 5% and 10% levels, respectively.

Table 9. Correlation coefficients between portfolio concentration and trade concentration, 2001–2009

	Exports (Current year)	Exports (3-yr mov. avg.)	Total Trade (Current year)	Total Trade (3-yr mov. avg.)
Austria	0.59*	0.35	0.46	0.16
Belgium	0.40	-0.07	0.29	-0.19
Chile	-0.47	-0.19	-0.48	-0.58
Czech Republic	0.55	0.41	0.51	0.43
Denmark	0.69**	0.79**	0.82***	0.88***
Estonia	0.64*	0.62*	0.47	0.55
Finland	0.51	0.72**	0.13	0.39
France	0.89***	0.97***	0.93***	0.98***
Germany	0.69**	0.54	0.49	0.46
Greece	-0.76**	-0.57	-0.80***	-0.83***
Hungary	-0.79**	-0.89***	-0.78**	-0.93***
Ireland	0.71**	0.75**	0.64*	0.75**
Israel	0.37	0.43	0.26	0.38
Italy	-0.72**	-0.72**	-0.72**	-0.70**
Japan	0.89***	0.85***	0.80***	0.85***
Korea	-0.39	-0.01	-0.08	0.22
Luxembourg	0.74**	0.72**	0.80***	0.80***
Mexico	0.19	0.23	0.06	0.16
Netherlands	0.90***	0.95***	0.90***	0.95***
Norway	-0.04	-0.74**	0.33	-0.22
Poland	0.53	0.44	0.53	0.45
Portugal	0.02	-0.08	0.06	-0.06
Slovak Republic	0.45	0.61*	0.50	0.70**
Spain	0.71**	0.93***	0.80***	0.95***
Sweden	0.92***	0.92***	0.90***	0.97***
Switzerland	0.09	-0.50	0.19	-0.34
UK	0.54	0.77**	0.66*	0.70**
USA	0.92***	0.93***	0.88***	0.92***

Source: Authors' calculations based on Direction of Trade Statistics Database, IMF. ***, ** and ** denote statistical significance at the 1%, 5% and 10% level, respectively.

Table 10: Two-step GMM estimation of instrumental variable regressions

	Panel Model			Cross-Section Model		
	Portfolio	Equity	Debt	Portfolio	Equity	Debt
	First-stage regression results					
Trade concentration (instrument)	-0.369***	0.137	0.276**	0.579***	0.284	1.027**
	(0.078)	(0.089)	(0.122)	(0.165)	(0.257)	(0.335)
F-test of excluded instrument (p-value)	0.000	0.127	0.027	0.009	0.309	0.027
	Second-stage regression results					
Financial integration	-0.006	-0.311	-0.074	-0.124*	-0.295	-0.079
	(0.036)	(0.261)	(0.065)	(0.064)	(0.214)	(0.068)
Portfolio concentration	1.287	-3.768	-1.131	0.003	-2.822	0.468
	(0.960)	(3.577)	(1.772)	(0.644)	(2.156)	(0.722)
OECD countries' share	-0.990*	3.490	0.921	0.240	2.387	-0.210
	(0.593)	(4.547)	(1.056)	(0.512)	(1.781)	(0.632)
Emerging markets' share	3.499***	5.408*	8.479***	7.251***	10.612***	7.757***
	(0.435)	(3.282)	(1.186)	(1.630)	(4.042)	(2.608)
Offshore financial centres' share	-0.060	3.147	-1.079	0.800	2.275	-3.574***
	(0.315)	(4.070)	(1.071)	(0.807)	(1.594)	(1.237)
Banks' share	0.034	-0.439	1.078***	-0.470	0.733	0.670**
	(0.124)	(1.021)	(0.377)	(0.309)	(1.184)	(0.326)
Non-bank financial institutions' share	-0.153	0.436	-0.505***	-0.090	-0.015	-0.279
	(0.159)	(0.288)	(0.130)	(0.323)	(0.449)	(0.340)
Households' share	-0.905	1.674	1.431*	-0.329	1.299	1.136
	(0.749)	(1.545)	(0.834)	(0.541)	(1.292)	(0.741)
Observations	90	79	83	15	14	13

Note: The dependent variable for the panel model is the volatility in cross-border portfolio returns (computed by taking the absolute change in the portfolio receipts to investment ratio), while the dependent variable for the cross-section model is the standard deviation of portfolio receipts (scaled by the investment ratio). Data includes a sample of 28 industrialized countries for the period 2001–2009. Financial integration is measured as the ratio of foreign portfolio investments and liabilities to GDP; portfolio concentration is the percentage share of investments in the five largest destination countries; OECD countries' share, emerging markets' share and offshore financial centres' share reflect the percentage shares of foreign portfolio investments made in that particular group of non-overlapping countries. Banks' share, non-bank financial institutions' share and households' share represent the percentage shares of portfolio holdings by these sectors in the sample countries. Heteroskedasticity robust standard errors are given in parentheses. ***, ** and * denote statistical significance at the 1%, 5% and 10% levels, respectively.