



SPECIAL FEATURES

A DISSECTING FOREIGN INVESTMENTS IN EURO AREA BOND MARKETS DURING THE SOVEREIGN DEBT CRISIS²²

At the peak of the euro area sovereign debt crisis (around the second half of 2011 and the first half of 2012) foreign investors retrenched from euro area bond markets. However, it is unclear to what extent these outflows reflected a general pattern of repatriation of overseas debt investments by global investors or a decision to disproportionately reduce foreign investments in euro area bond markets. Against this background, this special feature uses a standard gravity model of international portfolio flows to assess the extent to which the reduction in foreign investments in euro area bond markets was disproportionately large and whether this pattern changed after a number of policy measures were taken at the European level around the middle of 2012. It has been found that foreign investments in bond markets of stressed euro area countries were disproportionately small. In addition, this underinvestment cannot be fully explained by rating changes affecting the stressed countries. There is also evidence that this underinvestment disappeared after the announcement of the ECB's OMT programme. To the extent that euro area financial market fragmentation was driven by foreigners' disproportionate investments across euro area debt markets, this special feature finds that the impact of foreign investors has most likely been small. This largely reflects the limited quantitative significance of foreign portfolio debt investments in stressed countries and the absence of overinvestment in non-stressed economies. The temporary underinvestment in stressed euro area bond markets is consistent with the muted and temporary portfolio outflows from the euro area as a whole and the limited decline in the international use of the euro witnessed during the period of the euro area sovereign debt crisis.

I INTRODUCTION

It has been well documented that the launch of Economic and Monetary Union in 1999 resulted in greater financial integration in the euro area and in an increase in foreign investments in euro area debt and equity markets which also contributed to the growing importance of the euro in the international monetary system (see Lane, 2006; Spiegel, 2009; Blank and Buch, 2007; ECB, 2008a; ECB, 2008b; and Papaioannou and Portes, 2008). This period of global financial integration²³ was temporarily halted and partly reversed with the onset of the global financial crisis in 2008, when gross portfolio flows dropped sharply on account of repatriation of capital by global investors in response to heightened volatility in financial markets during the post-Lehman period.

While several studies have examined international portfolio flows during the global financial crisis (see Fratzscher, 2012; Milesi-Ferretti and Tille, 2011; and Galstyan and Lane, 2013), few studies have so far looked at the patterns of international portfolio flows during the euro area sovereign debt crisis.²⁴ In this respect, it remains unclear to what extent the retrenchment by foreign investors from euro area debt markets at the peak of the sovereign debt crisis (Chart 21) continued to reflect the earlier tendency of global investors to repatriate their foreign portfolio debt from all destination countries across the globe; or to what extent these outflows reflected a systematic underinvestment of foreign investors in euro area debt markets more specifically, possibly driven by the high bond

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²³ Financial globalisation in the pre-crisis era reflected a number of factors, including, in particular, a generalised financial deepening, a reduction in home bias and lower capital-flow restrictions (see Milesi-Ferretti and Tille, 2011).

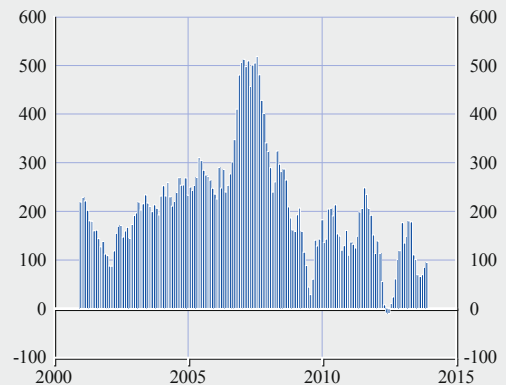
²⁴ Examining foreign portfolio flows to the euro area may shed light on the evolution of the international role of the euro because they are largely denominated in euro and thus involve the purchase of euro-denominated debt or equity by non-residents. At the end of 2013 the outstanding amounts of securities other than shares issued by euro area residents stood at €16,385.7 billion, of which €14,533.9 billion (around 89%) were denominated in euro.

market volatility in the euro area at the time or the perceived tail risk of a euro area break-up. All in all, the extent of retrenchment from the euro area as a whole appears limited and therefore raises the question of whether foreign investors essentially underinvested in stressed euro area countries, while at the same time tending to overinvest in non-stressed euro area countries. This approach of disproportionately adjusting investments across euro area debt markets points to the contribution that foreign investors may have made to euro area financial market fragmentation.²⁵

Against this background, Section 2 of this special feature uses a standard gravity model of international portfolio investments to put the observed portfolio bond flows during the euro area sovereign debt crisis in the perspective of global investments that could have been expected from standard investment determinants. Building on these findings, Section 3 empirically analyses the role of sovereign credit ratings in the observed pattern of foreign portfolio investments in euro area bond markets during the sovereign debt crisis, and whether flows to the euro area differed systematically prior to and after the announcement of the ECB's OMT programme. This programme aimed to reduce the unjustifiably high credit risk in certain euro area countries that had emerged on account of the perceived tail risk of a euro area break-up.

Chart 21 Foreign demand for euro area longterm debt instruments

(flows in EUR billion; 12-month cumulated)



Source: Euro area balance of payments data.

2 A STANDARD GRAVITY MODEL OF INTERNATIONAL PORTFOLIO FLOWS

2.1 STYLISTED FACTS

In order to benchmark international bond flows in the period of the euro area sovereign debt crisis, we use a standard gravity model of international financial investment. Since the seminal paper of Portes and Rey (2005), gravity models have been used extensively over the last ten years to model bilateral patterns in international financial investments (see, for example, Lane, 2006 and Spiegel, 2009). Ideally, one would need to resort to bilateral flow data, for example balance of payments data. However, euro area balance of payments data on portfolio flows do not provide information on the assets and liabilities of euro area countries by counterparty. Therefore, in this special feature data from the IMF's Coordinated Portfolio Investment Survey (CPIS) on bilateral gross portfolio debt and equity holdings are used. The annual dataset covers around 70 investor countries and over 200 destination countries for the period from 2001 to 2012.²⁶ Given that the euro area crisis

25 The non-stressed euro area countries include Germany, France, the Netherlands, Austria, Belgium and Finland. The stressed euro area countries include Italy, Spain, Ireland, Greece and Portugal. Other euro area countries are excluded owing to insufficient data availability.

26 The CPIS has various limitations (see Lane and Milesi-Ferretti, 2006). First, data for some major economies, including China, are missing. Second, the CPIS only provides information on the proximate destination of foreign portfolio investments, distorting the data for financial centres; for this reason major financial centres, such as Luxembourg, Switzerland and offshore tax havens, are excluded from the analysis. Third, being based on the residence principle, the CPIS does not account for the possibility that a resident entity may be foreign-owned. This represents an important deficiency to understand trends in foreign investment. In fact, BIS cross border banking statistics point out that banks in several jurisdictions had been using subsidiaries outside of the euro area to obtain funding; this trend could be related with the sovereign debt crisis or just a consequence of the strategy of asset liability management. Finally, the CPIS does not distinguish between debt issued by public and private agents, including financial institutions and corporate issuers.

manifested itself in financial stress in debt markets, the analysis presented here is confined to long-term debt securities.²⁷

In order to analyse foreign portfolio debt investments in the euro area during the crisis, we consider the period between the end of 2009 and the end of 2011. The reasons for choosing this start and end point are straightforward: first, foreign holdings of euro area debt instruments as of the end of 2009 should not have been affected by the looming euro area crisis by that point in time; second, considering the annual frequency of the CPIS data, holdings as of the end of 2011 should better reflect the cumulated impact of the sovereign debt crisis on foreign investors' euro area debt holdings than the end-2012 positions, which may have already been affected by the policy measures that were taken at the European and national levels during the second half of 2012, which included the launch of the banking union, the entry into effect of the ESM Treaty, the use being made by banks of the two three-year long-term refinancing operations offered by the ECB, the ECB's announcement of the modalities of the OMTs and various other measures taken by national governments.

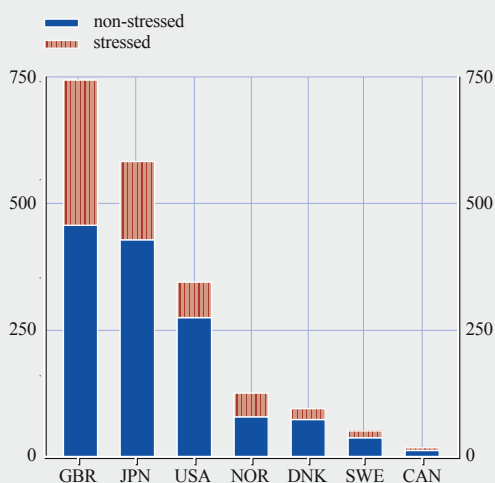
Chart 22 suggests that as of the end of 2009 major non-euro area economies' holdings of euro area countries' debt were largely concentrated on non-stressed countries, while holdings of stressed countries' debt were relatively low. In fact, as of the end of 2009, France's holdings of stressed euro area countries' debt instruments (amounting to USD 745 billion) were almost 50% higher than the combined holdings of the United States, the United Kingdom and Japan (USD 510 billion). Moreover, (non-valuation-adjusted) changes in stock positions between 2009 and 2011 suggest that holdings of stressed euro area countries' debt by major non-euro area countries dropped by around USD 115 billion (20%). At the same time, holdings of non-stressed euro area countries' debt by major non-euro area countries increased by around 3% (USD 38 billion).²⁸

²⁷ The CPIS also includes information on bilateral equity and short-term debt asset and liability positions. However, foreign equity holdings might be driven by factors that are different from those that determine debt securities holdings. Short-term debt securities are not analysed because the available information in the CPIS is considerably sparser across countries than for long-term debt securities. By definition, the CPIS does not contain data on interbank markets which are covered under "Other investment flows" in the balance of payments data but which also showed very clear signs of financial stress.

²⁸ By comparison, holdings of stressed euro area countries' debt in non-stressed economies plunged by almost 50%, equivalent to around USD 600 billion.

Chart 22 Major non-euro area countries' holdings of euro area debt in 2009

(volumes in USD billion)



Source: CPIS.

Note: The countries shown on the horizontal axis refer to investor countries.

2.2 EMPIRICAL SPECIFICATION

In line with the literature on international portfolio flows, the variation in changes in bilateral portfolio debt holdings between the end of 2009 and the end of 2011 across 53 investor countries and 113 destination countries is examined based on the following gravity model (see Galstyan and Lane, 2013 and Lane, 2006):

$$\Delta \ln(Stock_{ij0911}) = \alpha_i + \alpha_j + \beta_1 \ln(Stock_{ij09}) + \beta_2 \ln(Stock_{ij09})^2 + \beta_3 \ln(Imp_{ij09}) + \beta_4 \ln(Dist_{ij}) + \beta_5 Lang_{ij} + \beta_6 Z_{ij} + \varepsilon_{ij} \quad (1)$$

where $\Delta \ln(Stock_{ij0911})$ is the log change of country i 's holdings of country j 's long-term debt between the end of 2009 and the end of 2011; $\alpha_i + \alpha_j$ are investor and destination country fixed effects, respectively; $\ln(Stock_{ij09})$ is country j 's debt held by country i at the end of 2009; $\ln(Imp_{ij09})$ is the value of bilateral imports of country i from country j in 2009; and $Dist_{ij}$ and $Lang_{ij}$ are standard gravity variables that control for the distance between countries i and j and whether they share a common language. Finally, Z_{ij} is a vector of dummy variables, which equals one for specific country pairs. The latter are included in order to test whether changes in portfolio debt holdings between specific country groups during the euro area sovereign debt crisis were disproportionate relative to what standard gravity variables would predict.

The investor and destination country fixed effects capture common portfolio dynamics (see Galstyan and Lane, 2013) and, importantly, multilateral resistance terms (Okawa and van Wincoop, 2013). Specifically, α_i controls for uniform shifts in investor country i 's holdings of foreign debt assets, thereby capturing exogenous changes in a country's net foreign asset position vis-à-vis all destination countries. By comparison, α_j controls for uniform shifts in the destination country j 's foreign debt liability position, thereby capturing valuation effects that arise as a result of exchange rate and asset price movements.^{29, 30}

2.3 EMPIRICAL RESULTS

The regression results are reported in Table 3. The regression in column (1) tests whether foreign investors have disproportionately adjusted their investment in euro area bond markets during the sovereign debt crisis. Specifically, the dummy variable "EA" equals one if the investor country is a non-euro area economy and the destination country is a euro area country; the coefficient estimate is negative and statistically significant, suggesting that in the period between the end of 2009 and the end of 2011 foreign investors underinvested in euro area bond markets relative to the predictions of a gravity model. In fact, foreign investors were underweighted in euro area debt securities by around 20% relative to average investments across all country pairs over this period.³¹

29 Note that exchange rate effects are captured since CPIS data are reported in US dollar for all countries. This notwithstanding, = is unlikely to capture all valuation effects (because of differences in portfolio composition) and will capture variations in factors other than valuation effects (such as the average change in global investors' perception of country j).

30 The specification outlined in equation (1) may lead to a misinterpretation of the coefficients of the dummy variables, Z_{ij} . In particular, for each dummy variable that is included in equation (1) one investor or destination country fixed effect is dropped from the regression as a result of multicollinearity. This changes the benchmark group, i.e. the group against which the comparisons are made, and hence complicates the interpretation of the respective dummy variable. To overcome this issue, the regression outlined in equation (1) is replaced by a two-stage estimator. In the first-stage regression, the dependent variable is regressed on the investor country and destination country fixed effects only, which removes aggregate common factors from the data: $\Delta \ln(Stock_{ij0911}) = \alpha_i + \alpha_j + \varepsilon_{ij}$. The residuals from this regression, $\hat{\varepsilon}_{ij}$, are then used to estimate the second-stage regression: $\hat{\varepsilon}_{ij} = \beta_1 \ln(\widehat{Stock}_{ij09}) + \beta_2 \ln(\widehat{Stock}_{ij09})^2 + \beta_3 \ln(\widehat{Imp}_{ij09}) + \beta_4 \ln(\widehat{Dist}_{ij}) + \beta_5 \widehat{Lang}_{ij} + \beta_6 \widehat{Z}_{ij}$. The regressions are estimated using generalised least squares. Robust standard errors are reported.

31 Note again, that one important caveat about these results is that the model specification is unlikely to capture all valuation effects (because of differences in portfolio composition) and will capture variations in factors other than valuation effects.

The regression reported in column (2) tests whether the observed underinvestment by foreign residents in euro area bond markets occurred uniformly across stressed and non-stressed euro area countries, or whether non-euro area investors potentially overinvested in non-stressed euro area countries by rebalancing away from stressed euro area countries towards non-stressed euro area countries. The dummy variable “Non-stressed”, which equals one if the investor country is a non-euro area economy and the destination country is a non-stressed euro area country, is statistically insignificant, suggesting that there is no evidence of overinvestment by foreign investors in non-stressed bond markets. By contrast, the coefficient estimate of the dummy variable “Stressed”, which equals one for non-euro area investor countries and stressed euro area destination countries is negative and statistically significant. The results thus suggest that underinvestment by foreign investors in euro area debt markets has been confined to stressed euro area countries and that there is little evidence that foreign investors have engaged in intra-euro area rebalancing. To the extent that euro area financial market fragmentation was driven by foreigners’ disproportionate investments across euro area debt markets, these findings thus suggest that their contribution was small: first, foreign investors’ exposure to stressed countries was limited, as shown in Section 2.1; and second, there is little evidence of a parallel overinvestment in non-stressed economies.

Table 3 Regression estimates of changes in long-term debt

	(1)	(2)
Stock in 2009	-0.266*** (0.024)	-0.266*** (0.024)
Stock in 2009 ²	0.029*** (0.007)	0.028*** (0.007)
Imports in 2009	0.105* (0.058)	0.103* (0.058)
Distance	-0.287*** (0.046)	-0.284*** (0.046)
Common language	0.304*** (0.113)	0.306*** (0.113)
EA	-0.225*** (0.079)	
Non-stressed		-0.164 (0.104)
Stressed		-0.276** (0.123)
Observations	1526	1526
Marginal-R2	0.21	0.21

* p<0.10, ** p<0.05, *** p<0.01

Notes: Standard errors in parentheses. The marginal R² captures the explanatory power of the bilateral regressors that is not explained by the investor and destination country fixed effects. Estimated by GLS.

3 IMPACT OF SOVEREIGN RATING CHANGES AND PORTFOLIO ASYMMETRIES AFTER OMT

The observed underinvestment by foreign investors in euro area bond markets during the sovereign debt crisis could presumably be attributed to perceptions of heightened sovereign credit risk in stressed euro area countries (see Box). Against this background this section analyses the extent to which rating changes explain the disproportionate levels of portfolio debt investments in the euro area during the sovereign debt crisis, as documented in Section 2. The CPIS data cannot be used to examine this question, as their annual frequency makes it difficult to include cyclical fundamentals, such as ratings, in the regression. Therefore, data on net euro area bond purchases by foreign residents provided by the US Treasury and the Japanese Ministry of Finance have been used.³² While representing a considerably narrower sample in terms of the nationality of foreign investors, these data are available at a much higher frequency.³³

32 The data from the US Treasury cover monthly net foreign bond purchases by US residents. Similarly, the data from the Japanese Ministry of Finance cover net foreign bond purchases by Japanese residents.

33 The data have been transformed so that positive numbers reflect inflows to destination countries. Euro area countries are treated individually in the regressions for Japanese data and aggregated into stressed and non-stressed blocks for the US data in order to account for secular trends in net bond purchases in some individual non-stressed euro area countries.

THE ROLE OF SOVEREIGN CREDIT RATINGS FOR THE BEHAVIOUR OF FOREIGN INVESTORS DURING THE EURO AREA CRISIS

The observed underinvestment by foreign investors in euro area bond markets during the sovereign debt crisis could presumably be attributed to perceptions of heightened sovereign credit risk in stressed euro area countries. Specifically, for some foreign investors downgrades of the sovereign credit rating of several stressed euro area countries might have forced them to reduce their exposure to these economies as minimum rating requirements were no longer met. This stylised mechanical behaviour by foreign investors – which is more typical of institutional investors – might have been a result of regulation and market conventions (Basel Committee on Banking Supervision, 2009), and has been documented as one reason for the pro-cyclical behaviour of some institutional investors during the crisis (Papaioannou et al., 2013).²²

In order to illustrate the possible effects of rating downgrades on foreign portfolio debt investments in the euro area, two alternative stylised investment strategies have been considered. First, a global investor pursuing a portfolio rebalancing strategy which is subject to minimum rating requirements is considered.²³ This strategy involves the investor keeping pre-crisis portfolio weights unchanged by responding to changes in market prices and exchange rates with rebalancing flows. For example, if the market price of a certain asset in the portfolio rises (or falls), the investor would sell (or buy) this asset so that its portfolio weight once again corresponds to the initial weight. In addition, it has been assumed that the investor applies a simple rating rule to his entire portfolio, requiring all assets held to be rated above a certain threshold. The rating threshold has been set to AA-, implying that several stressed euro area countries would no longer have been eligible for investments at some point during the sovereign debt crisis. As shown in Chart A (a), under this rebalancing strategy an investor would have rebalanced away from stressed euro area countries towards non-stressed euro area countries in late 2011 and early 2012, keeping the exposure to the euro area as a whole unchanged.

The second investment strategy considered is a simple buy-and-hold strategy, which is subject to the same rating requirements as the rebalancing strategy. This strategy involves the investor holding all debt securities until maturity (which is assumed to lie outside the time horizon under consideration) unless a debt security no longer meets the minimum rating requirement. As shown in Chart A (b), under this strategy the investor would have sold bonds of euro area stressed countries as well, but would not have increased its exposure to non-stressed euro area countries. As a result, under the buy-and-hold strategy the investor's exposure to the euro area as a whole would have decreased moderately during late 2011 and early 2012.

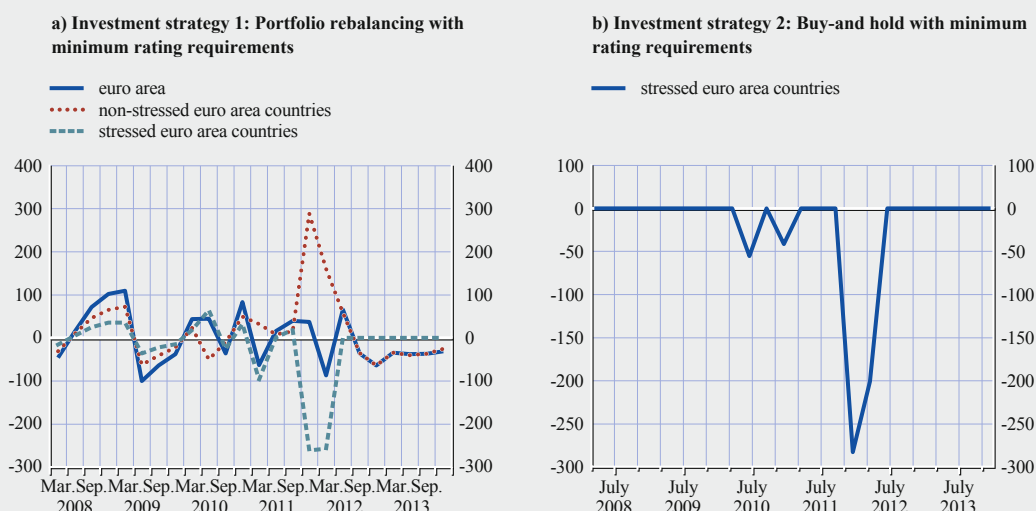
Comparing the capital flows generated by the two stylised investment strategies to actual euro area balance of payments data on portfolio debt liabilities suggests that a simple buy-and-

²² For example, under the Basel II framework, the standardised approach for assessing credit risk allows the application of zero-risk weights to claims on highly rated sovereigns (AAA to AA-). In addition, only investment-grade assets are included in certain government bond indices which are often tracked by investment funds.

²³ Under such a strategy, the investor is assumed to hold a global debt portfolio composed of government securities in US dollars, euro, Japanese yen, pounds sterling and Swiss francs. For illustrative purposes, the investor's initial asset allocation is assumed to correspond to the currency composition of global foreign exchange reserves as at the end of 2007, with allocations to euro area countries corresponding to their weight in euro area debt markets. As a result, the exposure of the investor to stressed euro area countries is assumed to have been limited to around 9% of total assets, whereas the exposure to non-stressed euro area countries is assumed to have been around 17%. Moreover, it is assumed that securities denominated in these currencies have been issued by the respective governments. In the case of the euro, it is assumed that the portfolio weights reflect the market size of outstanding debt securities by euro area country.

Chart A Hypothetical euro area capital flows for a global investor with a stylized investment strategy

(capital flows in USD billions)



Sources: ECB, IMF, Bloomberg, Datastream and ECB calculations.

Notes: It is assumed that the market prices and exchange rates change monthly and that the investor always rebalances the portfolio at the end of each quarter. Changes in market prices have been approximated with the price change of ten-year benchmark government bonds. Hypothetical capital flows are scaled for illustrative purposes to a total portfolio size of USD 6,700 billion, corresponding to total foreign exchange reserves as at the end of 2007. Under the second investment strategy, flows to non-stressed euro area countries are zero, i.e. outflows from the euro area correspond to those out of stressed countries.

hold strategy subject to minimum rating requirements can replicate outflows from euro area debt markets relatively well – at least regarding their timing (Chart B).²⁴ A portfolio rebalancing strategy which is subject to minimum rating requirements appears to be a less accurate approximation of the actual behaviour of foreign investors as it generates only marginal outflows from the euro area as a whole in late 2011 and early 2012.

Overall, these conclusions are consistent with the empirical findings presented in Section 2, namely that there is evidence for underinvestment by foreign investors in stressed euro area debt markets during the sovereign debt crisis, in particular in late 2011 and early 2012, but no evidence for overinvestment in non-stressed euro area countries during the same period.

Chart B Hypothetical and actual capital flows compared

(USD billions)



Sources: ECB, IMF, Bloomberg, Datastream and ECB calculations.

²⁴ Some investors – in particular central banks – appear to have pursued at least some portfolio rebalancing, as the share of euro-denominated assets in global foreign exchange reserves as reported in the IMF's COFER database remained more stable than under the buy-and-hold strategy with minimum rating requirements.

Columns (1) and (2) in Table 4 report results from regressions of net bond purchases (scaled by the destination country's GDP) np_{it} by Japanese and US residents in a standard gravity type model as already examined in Section 2; the regressions again include dummy variables EA_i^j indicating stressed and non-stressed euro area countries, the sum of the change of Moody's, Fitch and S&P sovereign credit ratings $\Delta ratings_{i,t-1}$, as well as total net foreign bond purchases by US and Japanese investors across all destination countries $totpurch_{it}$, which capture the effects of global variables, such as risk aversion.³⁴

$$np_{it} = \alpha + \beta_1 \ln(Stock_{i09}) + \beta_3 \ln(Imp_{i09}) + \beta_4 \ln(Dist_i) + \beta_5 Lang_i + \beta_6 totpurch_{it} + \beta_7 \Delta ratings_{i,t-1} + \beta_8 EA_i^{stressed} + \beta_9 EA_i^{non-stressed} + \varepsilon_{it} \quad (2)$$

The regressions are run separately for the data from the US Treasury and for the Japanese Ministry of Finance in order to allow for differences in the behaviour of the corresponding foreign investors. The coefficient estimates suggest that a rating downgrade of a destination country was indeed associated with a reduction of net foreign bond purchases by US and Japanese residents, even though the coefficient estimate is statistically significant only for the latter.³⁵ Moreover, in line with the results from Section 2, both Japanese and US investors underinvested in stressed euro area debt markets during the euro area sovereign debt crisis, as reflected by the statistically significant and negative dummy variable for stressed euro area countries. Most importantly, this result persists even though changes in sovereign ratings are controlled for. Thus, foreign investors' underinvestment in stressed euro area countries during the sovereign debt crisis cannot be fully accounted for by changes in the countries' sovereign ratings.

Table 4 Regression estimates for net foreign bond purchases by US and Japanese residents

	(1) US TICS, pre OMT	(2) JP MoF, pre OMT	(3) US TICS, post OMT	(4) JP MoF, post OMT
Stock in 2009	0.001 (0.005)	0.013** (0.005)	-0.005 (0.007)	-0.002 (0.002)
Imports in 2009	0.004 (0.007)	-0.021* (0.011)	0.012 (0.011)	0.005 (0.005)
Distance	-0.051*** (0.011)	-0.009 (0.011)	-0.025* (0.013)	-0.000 (0.007)
Common language	-0.000 (0.022)		0.015 (0.023)	
Total bond purchases	0.797* (0.443)	0.350*** (0.120)	0.537+ (0.392)	0.410* (0.207)
Lagged change in rating	-0.105 (0.135)	-0.220* (0.115)	0.349 (0.461)	0.118 (0.267)
Non-stressed	0.000 (0.013)	-0.013 (0.020)	0.039+ (0.023)	0.059* (0.031)
Stressed	-0.035*** (0.011)	-0.088*** (0.026)	0.014 (0.020)	0.005 (0.016)
Constant	0.380*** (0.122)	-0.002 (0.117)	0.219* (0.130)	-0.007 (0.094)
Observations	925	823	615	541
Adjusted R-squared	0.04	0.12	0.02	0.05
Notes: Standard errors in parentheses + p<0.2, * p<0.1, ** p<0.05, *** p<0.01				

34 Higher values reflect better ratings. The change in ratings is included in lagged terms in order to alleviate possible endogeneity. The results are robust to the inclusion of additional cyclical fundamentals, such as interest rate differentials, industrial production growth and changes in political risk.

35 Note that the model specification does not take into account that rating effects may be non-linear. For instance, the impact of a rating change (by one notch) that implies the loss of investment grade may be significantly larger than any other rating change by one notch.

Existing evidence suggests that the policy measures taken by the ECB during the sovereign debt crisis, including the two three-year long-term refinancing operations and the announcement of the modalities of OMTs, the launch of the banking union, and the entry into effect of the ESM Treaty have contributed to alleviating euro area financial market fragmentation and effectively eliminating the perceived tail risk of a euro area break-up (see Altavilla, Giannone and Lenza, 2014; De Santis, 2014; and ECB 2013). Against this background, columns (3) and (4) in Table 4 report the results from regressions for the time period from the announcement of the OMTs until May 2013, asking whether it also helped to cease the underinvestment by foreign investors in euro area debt markets. The results suggest that neither Japanese nor US investors continued to underinvest in stressed euro area countries after July 2012. Moreover, the (marginally) statistically significant and positive coefficient estimate for the non-stressed euro area country dummy variable suggests that Japanese and US investors seem to have somewhat overinvested in the portfolio debt of non-stressed euro area countries.

4 CONCLUSION

This special feature examines the behaviour of foreign investors during the euro area sovereign debt crisis based on a standard gravity model, and finds that international investors significantly underinvested in stressed euro area countries' debt markets during the peak period of this crisis. This underinvestment cannot be fully accounted for by changes in sovereign credit ratings of the countries concerned. To the extent that euro area financial market fragmentation was influenced by foreigners' underinvestment in euro area stressed countries, this special feature finds that their impact was small and disappeared after the middle of 2012.

REFERENCES

- Ahmed, S. and Zlate, A. (2013), "Capital Flows to Emerging Markets: A Brave New World?", *International Finance Discussion Papers*, No 1081, Board of Governors of the Federal Reserve System, Washington D.C.
- Altavilla, C, Giannone, D. and Lenza, M. (2014), *The Financial and Macroeconomic Effects of the OMT Announcement*, mimeo.
- Basel Committee on Banking Supervision (2009), "Stocktaking on the use of credit ratings", The Joint Forum, June.
- Blank, S. and Buch, C. (2007), "The Euro and Cross-Border Banking: Evidence from Bilateral Data", *Comparative Economic Studies*, 49(3), pp. 389-410.
- De Santis, R. (2014), *Quantifying redenomination risk*, mimeo.
- European Central Bank (2008a, *Monthly Bulletin, 10th Anniversary of the ECB*, Frankfurt am Main, June.
- European Central Bank (2008b), *The international role of the euro*, Frankfurt am Main, July.
- European Central Bank (2013) "*Financial Stability Review*", Frankfurt am Main, May.

Fratzscher, M. (2012), “Capital flows, push versus pull factors and the global financial crisis”, *Journal of International Economics*, Vol. 88(2), Elsevier, pp. 341-356.

Galstyan, V. and Lane, P.R. (2013), “Bilateral portfolio dynamics during the global financial crisis”, *European Economic Review*, Vol. 57(C), Elsevier, pp. 63-74.

Hale, G. and Obstfeld, M. (2013), *The Euro and the Geography of International Debt Flows*, mimeo.

Lane, P.R. (2006), “Global Bond Portfolios and EMU”, *International Journal of Central Banking*, Vol. 2(2), May.

Merler, S. and Pisani-Ferry, J. (2012). “Sudden stops in the euro area”, *Policy Contributions*, 2012/06, Bruegel.

Milesi-Ferretti, G.M. and Tille, C. (2011), “The great retrenchment: international capital flows during the global financial crisis”, *Economic Policy*, Vol. 26(66), pp. 285-342, April.

Okawa, Y. and van Wincoop, E. (2012), “Gravity in International Finance”, *Journal of International Economics*, Vol. 87(2), pp. 205-215.

Papaioannou, M.G. et al (2013), “Procyclical Behavior of Institutional Investors During the Recent Financial Crisis: Causes, Impacts, and Challenges”, *IMF Working Paper*, No 13/193.

Papaioannou, E. and Portes, R. (2008), “The international role of the euro: a status report”, *European Economy-Economic Papers*, No 317, Directorate General Economic and Monetary Affairs, European Commission.

Portes, R. and Rey, H. (2005), “The determinants of cross-border equity flows”, *Journal of International Economics*, Vol. 65(2), pp. 269-296, March.

Perold, A.F. and Sharpe, W.F. (1995), “Dynamic Strategies for Asset Allocation”, *Financial Analysts Journal*, Vol. 51, No 1, pp. 149-160, January/February.

Spiegel, M. (2009), “Monetary and Financial Integration in the EMU: Push or Pull?”, *Review of International Economics*, Vol. 17(4), Wiley Blackwell, pp. 751-776, September.

Zucman, G. (2013), “The Missing Wealth of Nations: Are Europe and the U.S. net Debtors or net Creditors?”, *The Quarterly Journal of Economics*, Vol. 128(3), pp. 1321-1364.