# *Home sovereign bias and Italian pension funds*: *true love or forced love?*

Paola De Vincentiis, Eleonora Isaia, Paola Zocchi*

March 2017

**Abstract**

Given that a review of prudential treatement of sovereign exposure is under debate at a global level, we would like to contribute shedding some light on financial institutions that have received much less attention than banks in a country that has the highest public debt of the European Union and a quite volatile sovereign risk. We empirically analyse the determinants of domestic sovereign bias in Italian pension funds using a proprietary database of accounting and structural information concerning both closed and open pension funds. Our hypothesis is that the unbalanced allocation toward Treasury bonds is mainly due to narrow mandates, rather than managers' familiarity and/or other features of the funds themselves. Our results confirm the hypothesis suggesting that simply removing some restrictions to the investment mandates - like in most of the European countries - might lead to a better portfolio diversification, even without - and for sure before - introducing hard and unpleasant measures like the adoption of concentration limits to sovereign exposure.

## I. Introduction

In the aftermath of the Euro-area's sovereign debt crisis, a significant review of the prudential treatment of sovereign exposures, which might lose their privileged zero risk weight, is under discussion at a global level. Considering that banks, insurance companies and other financial institutions, such as pension funds, are heavily exposed to their domestic sovereigns, the impact of a new capital charge and/or large exposure limits could be enormous (Battistini et al, 2013; Bijlsma and Vermeulen, 2015; Dull et al 2015). The introduction of the new reform may lead financial institutions to sell sovereign bonds, especially the riskier ones, in order to de-risk their investment portfolios and save regulatory capital. The proposals are still under debate, as they affect very delicate issues like sovereign funding conditions and their spillover effects on the economy. Nevertheless, the

* P. De Vincentiis and E. Isaia, University of Turin, Department of Management, Turin, Italy.
P. Zocchi, University Piemonte Orientale, Department of Economics and Business Studies, Novara, Italy.

significance of sovereign exposures calls for careful investigations on this topic, especially in the European countries with low creditworthiness, like Italy.

Italy is currently evaluated BBB, due to persistent weak economic fundamentals, high public debt, high unemployment rate, high fiscal pressure and lack of competitiveness. All Italian intermediaries are heavily biased towards domestic sovereign bonds. Putting the spotlight on the Italian pension funds, the Italian Supervisory Authority COVIP's annual report 2015 shows that 30 per cent of overall pension fund assets are invested in domestic Treasury bonds. This percentage rises up to 40-50 per cent, depending on the fund's nature, if we only consider the fixed income portfolio. The Italian bond market itself is unbalanced. Italy is the largest issuer of public debt securities in Europe. Thus, domestic government bonds dominate the market, covering 65 per cent of total issues, and are far more liquid than large corporate bonds, including financials.

From a prudential point of view, the home bias translates into excessive concentration risk. Considering that pension funds evaluate their assets at market price, large price movements in domestic sovereign bonds have a substantial impact on the performance and benefits offered by the whole pension fund sector. Solvency problems could even occur for lines that offer a minimum return guarantee and are obliged to keep their promises to investors.

For all these reasons, this paper empirically analyses the determinants of domestic sovereign bias in Italian pension funds. Our hypothesis is that the unbalanced allocation towards Italian Treasury bonds is mainly due to narrow mandates. In fact, restricted boundaries shrink the type of asset classes and geographical areas especially in pension fund lines with low risk profile, and force fund managers to shift their investment allocations towards a greater portion of domestic sovereign bonds. On this point, He and Xiong (2013) provide a theoretical model to explain why stringent mandates limit the fund manager's ability. At the same time, the fund managers' nationality, which means better information about their own country and familiarity with domestic markets and instruments, could contribute to reduce diversification opportunities and benefits (see references below). Instead, we do not expect structural features of pension funds to explain their sovereign home bias attitude, given a

kind of homogeneity in their portfolio management, as shown in a previous paper (De Vincentiis et al, 2016).

The first issue we needed to address was how to measure the bias itself. The easiest way is to weight the domestic sovereign bond allocation on the overall portfolio invested in EU sovereign bonds. This ratio is however too raw and does not properly allow us to isolate the pure effects of mandates versus other explicative variables, since the denominator, i.e. the total portfolio invested in European sovereign bonds, could be co-determined with the same mandate restrictions. Thus, in order to overcome potential endogeneity problems, we introduced a more precise indicator of domestic sovereign bias. Following Manna et al (2016), we created a neutral sovereign portfolio, unaffected by managers' allocation decisions and any other kind of external constraint, where each country weights only according to the amount of its public debt or GDP with respect to the total EU public debt or GDP. Therefore, the sovereign home bias is evaluated comparing the allocation of each pension fund of our sample with the neutral portfolio.

We then empirically test the influence of the mandate perimeter and manager's nationality on the Italian pension funds over-exposure to their domestic sovereign bonds, conducting an in-depth analysis across different investment lines and different time periods. Our results strongly support the hypothesis that restrictions on investment mandates increase the domestic sovereign bias, while exhibit a weaker link than expected between the presence of Italian managers and the exposure to their national public debt.

We trust that these results are important to understand the reasons of such attitude and help investors, fund managers and regulators properly address their actions and decisions. We would recommend policymakers and market participants to address their attention about sovereign risk exposure not only to banks and insurance companies but also to other institutional investors that, given their large asset allocation in sovereign debt, are likely to be indirectly affected by the decisions of the Basel Committee. Only including into the perimeter of the analysis all the intermediaries involved in the perverse loop of sovereign debt we could reach the fundamental goal of enhancing

the financial stability in the EU. Our results report not only a significant home bias in the European country with the highest public debt and a quite volatile sovereign risk, but also suggest that simply removing some restrictions to the investment mandates – like in most of the European countries – might lead to a better portfolio diversification, even without introducing hard and unpleasant measures like the adoption of concentration limits to sovereign exposure.

As far as we know, our work is the first paper on sovereign home bias in pension funds.

Surprisingly, despite the extensive literature on home bias, very few studies have researched the unexplored territory of pension funds, and none have specifically analysed the sovereign home bias. The most recent work to date that is closest to our analysis is conducted by Lippi (2016), who investigates the presence of country home bias in Italian occupational pension funds. He finds that the phenomenon is persistent over time and more pronounced when the risk profile is lower and the fund manager domestic. Only another two papers belong to this stream of literature, and both of them refer to a specific country. Lelyveld et al (2010) provides empirical evidence on domestic bias in Dutch pension fund asset allocation, mainly driven by fund inexperience, measured in terms of operational age, and risk-aversion attitudes that persuade to invest in more familiar markets during periods of high volatility or financial crisis. Karlsson and Norden (2007) investigate the home bias in Swedish individual pension plans adopting a different point of view. They test the relationship between the demographic and socioeconomic features of adherents and the likelihood of home bias in order to identify a typical home-biased candidate.

Enlarging the perimeter to all types of institutional and individual investors, the scientific production on home bias is rich and highly varied. Home bias is an old worldwide phenomenon and in the course of time many researchers have offered their contribution to explain the tendency to overweight domestic holdings at the expenses of foreign securities, especially in the fixed income portfolios. In brief, there are mainly two types of explanations, namely market constrictions and investor behaviour. As for the first category, many factors may reduce returns from investing abroad or limit investors' 'capability to hold foreign asset transaction costs' (Glassman and Riddick, 2001;

Coeurdacier and Rey, 2012), difference in tax treatment, limits on cross-border investment (French and Poterba,1991), real exchange rate (Fidora et al 2006), and market transparency (Giofrè, 2013). But, as French and Poterba say, such constraints are not binding and appear unable to fully explain limited international diversification. This implies that home bias is primarily the result of investor behaviour. Tesar and Werner (1995), Coval and Moskovitz (1999), Campbell and Kraussel (2007) and Dziuda and Mondria (2012)) demonstrate that asymmetrical information is the main ingredient of domestic bias. Asymmetrical information produces the familiarity theory (Chan et al., 2005; McQueen and Stenkrona, 2012; Pool et al., 2012), the optimism or overconfidence theory (Suh 2005) and the geographic proximity theory (Campell and Kraüssl, 2007; Giofrè, 2013; Coval and Moskovitz, 1999), which explain why investors consistently favour domestic securities.

In conclusion, the major strengths of our work are the following:

- to date, it is the first analysis that focuses on exposure to sovereign risk in the pension fund sector, contributing to the current debate on the enforcement of the sovereign risk prudential treatment by looking at intermediaries different from banks;
- it is the first analysis that empirically tests the relationship between fund managers' mandate perimeter and portfolio diversification-bias, theoretically proposed by He and Xiong (2013);
- it offers a new contribution to the previous specific literature on the assessment of foreign managers, introducing new indicators that more precisely capture the role and incidence of foreign fund managers with respect to domestic fund managers.

## II. Sample description and methodology

Our analysis is based on a proprietary database of accounting and structural information concerning both closed (occupational) and open pension funds operating in Italy. Starting from the complete list of pension funds available at the website of the Commission supervising the sector (Commissione di Vigilanza sui Fondi Pensione – COVIP), we built a dataset based on information extracted from

financial statements, statutes and informative notes for the period 2008-2014, considering all investment lines, both with and without a minimum return guarantee. The data summarised in Table 1 show that our sample coverage of the universe in analysis is more than satisfactory. The sample includes 70 pension funds, subdivided into 230 investment lines. In terms of investment lines, the database represents 63.71 per cent of the total, whereas the coverage increases to 71.30 per cent when we look at the amount of assets under management (AUM). The sample represents a wider share of the universe in the sub-sector of the guaranteed lines, which is particularly interesting for our research question (see second section of Table 1). In this case, the sample includes above 70 per cent of the lines and 91 per cent of the net asset value. Table 2 focuses on the distribution of investment lines by level of risk declared by the fund informative note. Data show that the sample is well balanced across this dimension with only a slight over-representation of the "low risk" class due to the presence of the guaranteed funds that often belong to this segment.

[Insert Table 1 and Table 2]

We want to explore the size of domestic sovereign exposure as a function of three main sets of determinants, described in detail in Table 3.

First, we use a few independent variables that account for the rigidity of the investment mandate to asset managers. This is the core and most original part of our analysis. We assume that a narrower investment mandate can induce the fund manager to higher sovereign exposure, since the diversification opportunities available are limited (He and Xoing, 2013; Lippi 2016). This could be particularly the case for a country, like Italy, where sovereign bonds offer interesting returns due to the high weight of public debt (Battistini et al 2013). Thus, we expect all limitations to the investable domain to be associated with a greater home sovereign bias. The main constraints considered include the geographical extension of the area where securities can be chosen, the maximum amount of equity allowed in the asset allocation by the Statute of the fund and the presence of a minimum return

guarantee. For the guaranteed lines, in particular, we expect domestic sovereign exposure to be heavier when the commitment to participants in terms of minimum return level becomes broader. A most controversial aspect is the effect of the extension of events covered by the guarantee. A wider commitment could increase the home bias representing a further rigidity of the investment mandate. Furthermore, the inclusion of the voluntary change of pension funds among the events covered by the guarantee could push managers to keep more liquidity as a precautionary cushion, thus decreasing the weight of sovereign bonds on total assets. The expected sign of the variable is consequently uncertain.

Secondly, we introduce a set of regressors related to the composition and diversification of the asset management team. We consider the total number of intermediaries in charge of asset management, expecting a negative association with the domestic sovereign bias. We also consider the presence of foreign managers and the share of assets under management they are in charge of. In line with a strong stream of literature (Chan et al, 2005; McQueen and Stenkrona, 2012; Pool and al, 2012), fund managers are prone to choose domestic bonds, since they know their market better (familiarity theory) and are more confident in their choices (information theory). Therefore, we expect pension funds where foreign intermediaries manage a larger share of the investment portfolio to have a lower degree of domestic sovereign exposure. As far as the role of foreign managers is concerned, this work gives a valuable contribution to literature. To our knowledge, only Lippi (2016) deals with this issue for pension funds. Lippi, however, applies a set of dummies that overlook the share of assets actually managed by foreign intermediaries. We observe the presence of foreign managers alongside other Italian managers, and we note that in several cases the share of assets given to foreign managers is quite small, precisely 25 per cent on average, but the median of the distribution is zero (see Table 3). In order to better represent the actual weight of foreign intermediaries inside the management pool of the pension fund, we consider two variables, namely the number of foreign managers to the total number of managers (No_foreign_managers), and the share of AUM managed by foreign managers (Relevance_foreign_managers).

Finally, the third set of regressors controls the structural features of the fund that could have an impact of asset allocation, like the size of assets under management, the juridical status and the amount of cash inflow/outflow on an annual basis for contributions received/benefits paid. Among these variables, the most discussed in literature is the size that we measure through the net asset value logarithm. The evidence of previous studies is mixed. Some authors find negative relations between size and home bias, explaining the phenomenon with the greater diversification opportunities offered by larger assets under management (Ni 2009, Dyck and Pomorski 2011). On the contrary, Hau and Ray (2008) find a strong, though counter-intuitive, positive association. This mixed evidence explains the uncertain sign reported in Table 3.

[Insert Table 3]

As already explained in the previous paragraph, we measure the size of the domestic sovereign exposure for each investment line using three alternative dependent variables. The first one represents the share of sovereign bond portfolio invested in Italian Treasury bonds (Y1). The other two variables compare the actual extent of Italian sovereign exposure to a neutral one that reflects either the relative share of Italian public debt or the weight of Italian GDP over the total computed for the European Union on a yearly basis (respectively, Y2 and Y3).

Table 4, 5 and 6 provide some descriptive statistics concerning our three dependent variables as a function of the main explicative factors described above. Starting from Table 4, we can first observe that the exposure to domestic Treasury bonds is substantial for Italian pension funds, being on average 54.31 per cent of total sovereign portfolio. This weight is much higher than it should be in a neutral portfolio allocation. The mean over-exposure amounts to 35.71 or 42,08 per cent if we look respectively at Y(2) and Y(3) variables. The share of domestic sovereign bonds is even more significant in the subsample of guaranteed lines that normally have narrow investment mandates and very conservative portfolio allocation (De Vincentiis et al, 2016). In this case, in fact, the average weight of Italian Treasury bonds is 64.74 per cent and the mean over-exposure rises to 46.20 if we

look at public debt composition or 52.54 if we consider the Italian share of total European GDP. These data clearly indicate that sovereign portfolio allocation is substantially distorted towards domestic public debt.

In Table 5 we can observe the average share of domestic sovereign exposure as a function of two core features of the investment mandate, namely the maximum amount of equity allowed in the asset allocation and the geographical extension of the investment spectrum, with particular reference to the possibility of buying securities outside Europe. The Table also reports the mean level of our three dependent variables by risk level of the investment line, as declared in the fund Statute, both for the entire sample and the subsample of guaranteed compartments. The data confirm once again the greater domestic sovereign exposure that characterises the investment lines with a minimum return guarantee. Furthermore, we can observe how the presence of stricter constraints in the investment mandate are associated with a higher degree of home sovereign exposure and over-exposure compared to a neutral portfolio. Indeed, funds invested only in the European area have on average a higher share of domestic securities in their sovereign portfolios, compared to the investment lines that are not geographically constrained. The difference in the mean values of the dependent variables is highly significant from a statistical point of view. Similarly, the funds that can invest less than 25 per cent in equities tend to overweight their domestic sovereign exposure. In this case the evidence is somewhat weaker, but the sign of the mean difference is consistent with our expectations. The domestic sovereign exposure and over-exposure is negatively correlated to the risk level of the investment line. This evidence is coherent with the weaker investment constraints that normally characterise the riskier compartments of pension funds.

[Insert Table 4 and 5]

Table 6 offers a time distribution of the domestic sovereign exposure. The share of domestic sovereign bond in portfolio increases until 2010 and then slightly reduces its magnitude. However,

we note that such recent decrease is not shared by all pension funds, since those funds which invest only in Europe experienced a new grow in the sovereign home bias in 2014.

[Insert Table 6]

To conclude our sample description, Table 7 analyses the other potential driver of domestic sovereign bias i.e. the composition and diversification of the pension fund's pool of asset managers. First of all, we can note the strong negative correlation between the total number of intermediaries involved in the portfolio management and the degree of sovereign domestic exposure. When the management team is more numerous, it is more probable that specialised intermediaries may be involved, thus enhancing portfolio diversification. A strong negative relation is also evident between the domestic sovereign bias and the weight of foreign intermediaries in the asset management team. This is true both when we look at the number of foreign managers and at the share of portfolio under their responsibility.

[Insert Table 7]

At a merely descriptive level, our hypothesis that home sovereign bias may depend both on investment constraints and on market familiarity of asset managers seems thus confirmed.

## III Empirical analysis

The empirical analysis aims to ascertain whether mandate constraints play a significant role in shaping the exposure to the domestic sovereign risk of Italian pension funds. Our dependent variables are:

- Y1, which is the share of the Italian sovereign bonds on the total European sovereign portfolio;
- Y2 and Y3, which are computed as the difference between Y1 and the share of Italy in two alternative European-sovereign risk-neutral portfolios, respectively based on total European-sovereign debt and European GDP.

With these dependent variables, we firstly perform a panel analysis, over the time-period 2008-2014, on the whole sample of 70 pension funds and 230 investment lines.

As baseline equation, we consider a set of explanatory variables related to the characteristics of the investment mandates, the characteristics of the management team, fund-specific controls and investment lines, and time fixed effects.

$$Y = F(Inv\_area_{it}, Guarantee_{it}, No\_managers_{it}, Relevance\_foreing\_managers_{it}, Fund\_type_{it}, Nav_{it}, Net\_contribution_{it}, Benefits_{it}, Investment\text{-}Line_i, Year_t) \quad (1)$$

Equation (2) differs from the previous one only for the variable applied in testing the role of foreign managers, which is no longer the share of their assets under management to the total AUM (Relevance_foreing_managers), but their number as a percentage of total managers (No_foreign_managers).

$$Y = F(Inv\_area_{it}, Guarantee_{it}, No\_managers_{it}, No\_foreign\_managers_{it}, Fund\_type_{it}, Nav_{it}, Net\_contribution_{it}, Benefits_{it}, Investment\text{-}Line_i, Year_t) \quad (2)$$

In Equation (3) we test results stability by dropping from the previous model investment lines and time fixed effects.

$$Y = F(Inv\_area_{it}, Guarantee_{it}, No\_managers_{it}, No\_foreign\_managers_{it}, Fund\_type_{it}, Nav_{it}, Net\_contribution_{it}, Benefits_{it}) \quad (3)$$

Results in Table 8 show that the variables related to the perimeter of the investment area and the presence of a minimum guaranteed return are significant in all model specifications and for all the dependent variables. Moreover, we observe that the variables Inv_area and Guarantee show the highest explanatory power. Extending the investment spectrum outside Europe leads to a 4.5 per cent

decrease in the share of assets allocated to domestic sovereign bonds, while the weight of Italian sovereign bonds increases by 11 per cent, if the fund provides a minimum return guarantee.

[Insert Table 8]

In line with Lippi (2016), we find that the presence of foreign managers is significant. As expected, a greater incidence of foreign managers reduces the degree of sovereign domestic-bias. However, we note that the dimension of this reduction is quite small. In fact, a 1 per cent increase in the share of AUM allocated to foreign managers generates roughly a 0.1 per cent reduction in the asset invested in Italian sovereign bonds. Thus, we conclude that, as far as the exposure of domestic credit risk is concerned, the influence of foreign managers is not incisive except for the case they manage a relevant share of fund's assets.

The No_managers variable is significant only in the equation with Y2 as dependent variable. Since it appears with negative sign, it means that one unit increase in the number of managers achieves a 2 per cent decrease in the AUM allocated to Italian sovereign bonds. Of course, it is likely that benefits in terms of portfolio diversification could be compensated by higher costs for adherents. Thus, the opportunity of partitioning of the AUM among various managers should be accurately evaluated considering all the aspects involved.

Since the presence of a guarantee commitment significantly increases the share of domestic sovereign bonds in the European sovereign portfolio, we investigate the guaranteed lines in depth. Thus, on a sub-sample of 81 guaranteed-investment lines belonging to 70 funds, we estimate equation (4), which adds to equation (1) controls for the guarantee commitment. Firstly, we test the influence of the type of guarantee provided between a capital guarantee and a higher minimum guaranteed return (Guarantee_type). Secondly, we investigate the influence of the dummy Discretional_choice, which is equal to one, if the guarantee also applies when the adherent exercises his discretionary option of leaving the guaranteed line, i.e. changing risk-profile inside the same fund or moving to another pension fund.

$$Y = F(Inv\_area_{it}, Guarantee\_type_{t}, Discretional\_choice_{t}, No\_managers_{it}, Relevance\_foreing\_managers_{it}, Fund\_type_{it}, Nav_{it}, Net\_contribution_{it}, Benefits_{it}, Investment\text{-}Line_{i}, Year_{t}) \quad (4)$$

Outcomes in Table 9 show that both guarantee-specific controls are significant. A guarantee commitment higher than the zero nominal rate increases the domestic sovereign bias by 6 per cent. It is worth noting that more than half of the guaranteed lines offers a minimum guaranteed return higher than the capital guarantee, moreover the nominal guaranteed return offered in 2014 varies from 0.25 to 2.25 per cent. Conversely, the extension of the guarantee obligation to circumstances that entail a discretional exit from the fund by adherents reduces the share of Italian bonds by 6.6 per cent. Actually, it is likely that in this case a greater cash flow instability induces managers to keep a higher share of deposits and other liquid assets, such as sovereign bonds of high-rated issuers.

We finally observe that a one per cent increase in the share of assets managed by foreign managers reduces by 0.1 per cent the weight of Italian sovereign bonds in portfolio, which is the same influence we have found for the whole sample (Table 8).

[Insert Table 9]

We also perform our panel analysis on five sub-samples characterized by homogeneous risk profiles (Table 2). Equation (5) replicates the analysis of equation (1) except for a new control variable accounting for the rigidity of the investment mandate: (Max_Equity), which is the maximum share of equity investment resulting from the investment mandate.

$$Y = F(Inv\_area_{it}, Guarantee_{it}, Max\_Equity_{it}\ No\_managers_{it}, Relevance\_foreing\_managers_{it}, Fund\_type_{it}, Nav_{it}, Net\_contribution_{it}, Benefits_{it}, Year_{t}) \quad (5)$$

Results in Table 10 show that the explanatory power of the variables related to mandate restrictions is different among the five investment-lines. Limitation in the investment area and minimum guaranteed returns influence the degree of sovereign home bias of the low-risk and medium-risk lines,

while restrictions on the equity investments have a significant incidence only for the high-risk lines. The magnitude of the relationship between the sovereign home bias and the equity-restrictions appears particularly relevant, since a one per cent decrease in the equity-restrictions generates a 3 per cent reduction of the sovereign home bias.

It is also interesting to observe that foreign managers play a significant role in reducing the domestic sovereign exposure of the UE bond portfolio only for the low-risk, medium-high and high risk profiles. Moreover, the size of this positive influence is twofold for the riskier lines.

[Insert Table 10]

As shown in Table 6, the degree of sovereign home bias changes along the period of time under analysis, which comprises the sovereign debt crisis, that experienced its peak between the end of 2011 and the first half of 2012. Since market conditions considerably change during the period 2008-2014, we are interested in understanding how the perimeter of the investment mandates affects managers' asset allocation decisions, through time.

To this end, we perform a cross-section analysis by year. Results of OLS estimations are in Table 11. We find that, the presence of a minimum guaranteed return increases by 19 per cent the home bias in the pre sovereign-debt crisis period (2008-2010), while it loses any significance in the post-crisis period (2011-2014). It is worth to note that managers considerably reduce their guarantee commitment during the period under analysis, induced by the low level of interest rates. The guaranteed return was on average 1.64 per cent in 2008 and 0.74 in 2014, while the median guaranteed rate was 2 per cent in 2008 and zero per cent in 2014.

As far as the limitations of the investment area are concerned, we find that this issue is not significant until 2012. Since 2013 it is significant and plays a decisive role: those funds that can diversify their portfolios outside UE show, on average, a 11 per cent reduction of the degree of home bias in the UE sovereign portfolio and a 14 per cent reduction in 2014. Actually it is likely that, the current low level of interest rates forces those fund managers that face a restriction of the investment area to the EU to

overexpose their sovereign bond portfolio toward Italy that offers higher returns than other European countries with higher rating.

The presence of foreign managers plays a significant role in reducing the degree of sovereign home bias of the UE sovereign portfolio along all the time-period under analysis except for 2014.

We also observe that those funds with higher AUM show a greater degree of home bias in 2010 and 2014, probably because they face a greater rigidity in pursuing portfolio reallocation strategies than small funds.

[Insert Table 11]

**IV. Robustness check**

By checking in the funds' financial statement detailed information on asset allocation, we observe that many funds that face a geographical limitation to the UE-area de facto interpret this commitment in a more restrictive way by composing Euro-area portfolios instead of UE-area portfolios, in order to avoid any exposure in foreign currencies. For this reason, we compute two "more restrictive" dependent variables based on two alternative "Euro-area" risk-neutral portfolios:

Y4 = Y1 – share of Italian debt on total euro-area sovereign debt

Y5= Y1 – share of Italian GDP on total euro-area GDP

For both Y4 and Y5 we run our base model in equation (1) and its variations in equations (4) and (5) respectively for the guaranteed lines and for the five sub-samples by risk-profile. Comparing Y4 with Y2, we observe that the degree of home bias is 5 per cent greater if we consider the "Euro-area" risk neutral portfolio. In contrast, comparing Y5 with Y3, the average level of home bias is 4 per cent lower for the "Euro-area" risk neutral portfolio. Results in Table 12 and 13 confirm the same evidences already presented in the previous section.

[Insert Table 12]

[Insert Table 13]

## V. Conclusion

The paper investigates the influence of mandate restrictions on Italian pension funds' exposure to the domestic sovereign bonds during the period 2008-2014. The analysis focuses on a sample of 70 funds, which represents more than 70 per cent of the market in terms of NAV. In order to avoid endogeneity problems, we compute our dependent variables adopting three alternative methods that allow a proper evaluation of the exposure toward Italian sovereign bonds among funds with different risk-profiles. To this end, we consider the share of Italian sovereign bonds over the European sovereign portfolio and we compare this measure with the weight of Italian sovereign bond in a risk-neutral portfolio. This way, we obtain a measure of sovereign home-bias that we apply in a panel analysis. Results indicate that the main determinant of an increase in the weight of Italian sovereign bonds is the presence of restrictions in the investment mandate. The existence of a minimum guaranteed return determines on average an 11 per cent increase in the share of the European sovereign portfolio allocated to Italian bonds. Moreover, the presence of a guarantee determines a greater exposure to Italian sovereign bonds for the low and medium-low risk lines (respectively 19 and 16 per cent higher). Moreover, those guaranteed lines offering a guarantee greater than the zero nominal rate show, on average, a share of sovereign portfolio invested in domestic treasury bonds 7 per cent higher than that of lines providing only a capital guarantee.

Extending the investment spectrum to Europe the share of Italian sovereign bond decreases by 4.5 per cent on average, but the benefits are greater for guaranteed lines (a 6 per cent reduction) and low risky lines (a 7.6 reduction).

A limitation of the equity investment is associated to a not trivial increase of the weight of the domestic sovereign bonds for the high-risk lines (a one per cent decrease in the maximum equity investment is associated to a 3 per cent increase in the share of Italian bonds).

In line with previous empirical literature on home bias, which however does not investigate the specific issue of the domestic-sovereign-bias, we find evidence of a lower concentration of the Italian sovereign risk as the share of AUM to foreign managers increases. However, the intensity of this association does not appear incisive.

This paper contributes to the current debate on the review of prudential treatment of sovereign risk, shedding some light on the sovereign risk-exposure of financial institutions that have received far less attention than banks, such as pension funds. Since pension funds evaluate their assets at market price, large price movements in domestic sovereign bonds may have a substantial impact on their performance and on the benefits offered to adherents. Solvency problems are also likely to occur for pension funds that offer minimum return guarantees. Our empirical analysis suggests that the level of sovereign risk exposure, which characterised Italian pension funds, is not only a matter of experience, familiarity or geographical proximity of the management team, since it appears to be related to the perimeter of the investment mandate. This finding suggests that exposure to the domestic-sovereign risk of Italian pension funds would probably reduce after specific mandate restrictions have loosened. Our results also suggest the need for an in depth investigation of the relationship between mandate restrictions and asset allocation biases in the mutual fund industry.

## *References*


Battistini N., Pagano M., Simonelli S., 2013, Systemic Risk and Home Bias in the Euro Area, Economic Paper European Commission, No 494.

Berriel T.C., Bhattarai S., 2013, Hedging Against the Government: A Solution to the Home Asset Bias Puzzle, *American Economic Journal: Macroeconomics*, 5(1): 102–134.

Bijlsma M., Vermeulen R., 2015, Insurance companies'trading behavior during the Eurpean sovereign debt crisis: Flight home or flight to quality?, Working paper de Nederlandsche Bank, No 468.

Campbell, R. A. Kräussl, R., 2006, Revisiting the home bias puzzle: Downside equity Risk, CFS Working Paper, No. 2006/31.

Chan K., Covrig V., Ng L., 2005, What determines the domestic bias and foreign bias? Evidence from mutual fund equity allocation worldwide, *Journal of Finance 60*, 1495-1534.

Coeurdacier N., Rey H., 2012, Home Bias in Open Economy Financial Macroeconomics, *Journal of Economic Literature*, 2012, 51(1), 63–115.

Coval J., Moskowitz T., 1999, Home Bias at Home: Local Equity Preference in Domestic Portfolios, *The Journal of Finance*, Vol. Liv., No. 6.

De Vincentiis P., Isaia E., Zocchi P., 2016, Do Italian DC pension funds meet minimum return guarantees?, *Journal of Pension Economics and Finance*, first view.

Dyck I.A., Pomorski L., (2011), Is bigger better? Size and performance in pension plan management, Rotman School of Management Working paper n.1690724, University of Toronto.

Dull R, Konig F, Ohls J., 2015, On the exposure of insurance companies to sovereign risk – portfolio investments and market forces, Discussion Paper Deutsche Bundesbank, No 34.

Dziuda W., Mondria J., 2012, Asymmetric Information, Portfolio Managers, and Home Bias, *The n.Review of Financial Studies*, Vol 25, No. 7, 2109-2154.

French K., Poterba J., 1991, Investor diversification and international equity markets, *American Economic Review 81 (2)*, 222-226.

Giofrè M., 2013, International diversification: Households versus institutional investors, *North American Journal of Economics and Finance 26*, 145-176.

Hau H., Rey H., 2008, Home bias at the fund level, National bureau of economic research, Working Paper 14172.

He Z., Xiong W., 2013, Delegated asset management, investment mandates, and capital immobility, *Journal of Financial Economics*, 107, 239-258.

Karlsson A., Norden L., 2007, Home sweet home: Home bias and international diversification among individual investors, *Journal of Banking and Finance*, 31, 317-333.

Leyveld I., Rubbaniy G., Verschoor W., 2014, Home bias and Dutch Pension Funds 'Investment Behaviour, *European Journal of Finance*, 20 (11), 978-993.

Lippi A., 2016, Country home bias in Italian occupational pension funds asset allocation choices, *The Quarterly Review of Economics and Finance*, No. 59, 78–82

Manna M., Signoretti F., Tommasino P., 2016, Large-country bias and the limits on sovereign concentration risk, *Banca d'Italia Notes on Financial Stability and Supervision*, No.5.

McQueen G., Stenkrona A., 2012, The home-institution bias, *Journal of Banking & Finance*, No. 36, 1627–1638

Ni J., 2009, The effects of portfolio size on international equity home bias puzzle, *International Review of Economics & Finance*, 18, 3, 469-478.

Pool V., Stoffman N., Yonker S., 2012, No Place Like Home: Familiarity in Mutual Fund Manager Portfolio Choice, *The Review of Financial Studies*, Vol. 25, No. 8, 2563-2599.

Lelyveld I. P.P., Rubbaniy G., Verschoor W. F.C., 2013, Home bias and Dutch pension funds' investment behavior, *The European Journal of Finance*.

Suh J., 2005, Home bias among institutional investors: a study of the Economist Quartely Portfolio Poll, *Journal of the Japanese and International Economies*, 19, 72-95.

Tesar L., Werner I., 1995 Home bias and high turnover, *Journal of International Money and Finance*, Vol. 14, No. 4, 467-492.

Varas F., Walker E., 2011, Optimal close-to-home biases in asset allocation, *Journal of Business Research*, No. 64, 328–337.

**Table 1 - Sample coverage – Number of investment lines and assets under management** (Data in Eur and percentage, as of 31 December 2014)

| **All investment lines** | | | |
|---|---|---|---|
| | Sample | Total | % coverage |
| No. funds | 70 | 94 | 74.47 |
| Closed funds | 35 | 38 | 92.11 |
| Open funds | 35 | 56 | 62.50 |
| No. of lines | 230 | 361 | 63.71 |
| Closed funds | 86 | 108 | 79.63 |
| Open funds | 144 | 253 | 56.92 |
| Net asset value | 38,234,814,613 | 53,624,000,000 | 71.30 |
| Closed funds | 33,051,146,537 | 39,644,000,000 | 83.37 |
| Open funds | 5,183,668,076 | 13,980,000,000 | 37.08 |

| **Guaranteed lines** | | | |
|---|---|---|---|
| | Sample | Total | % coverage |
| No. of lines | 81 | 111 | 72.97 |
| Closed funds | 35 | 36 | 97.22 |
| Open funds | 46 | 75 | 61.33 |
| Net asset value | 7,167,162,619 | 7,875,636,000 | 91.00 |
| Closed funds | 5,694,424,440 | 5,708,736,000 | 99.75 |
| Open funds | 1,472,738,179 | 2,166,900,000 | 67.97 |

**Table 2 - Sample distribution by level of risk of the asset management** (Data in Eur and percentage, as of 31 December 2014)

| **Level of risk** | **Number of lines** | **In %** |
|---|---|---|
| Low | 69 | 30.00 |
| Medium-Low | 32 | 13.91 |
| Medium | 49 | 21.30 |
| Medium-High | 42 | 18.26 |
| High | 33 | 14.35 |
| Nd | 5 | 2.17 |
| Total | 230 | 100.00 |

**Table 3 - Explanatory variables: definitive, expected sign and descriptive statistics**

| Variables | Description | Expected sign | Mean | Median | Standard Dev. | Max | Min | Obs |
|---|---|---|---|---|---|---|---|---|
| **Inv_area** | Dummy = 1 if the investment area extends to all OECD countries. | - | 0.75 | 1 | 0.43 | 1 | 0 | 1,402 |
| **Max_Equity** | Maximum share of equity investment resulting from the investment mandate. | - | 0.3744 | 0.35 | 0.2928 | 1 | 0 | 1,115 |
| **Guarantee** | Dummy = 1 if there is a minimum guaranteed return. | + | 0.36 | 0 | 0.48 | 1 | 0 | 1,428 |
| **Guarantee_type** | Dummy = 1 if the minimum guaranteed return is greater than a capital guarantee. | + | 0.67 | 1 | 0.47 | 1 | 0 | 518 |
| **Discretional_choice** | Dummy = 1 if the guarantee operates in case of voluntary changes of fund or investment line. | + | 0.29 | 0 | 0.46 | 1 | 0 | 511 |
| **No_managers** | Number of managers. | - | 1.45 | 1.11 | 0.2508 | 9 | 1 | 1,422 |
| **No_foreign_managers** | Number of foreign managers as a percentage of total managers. | - | 0.2845 | 0 | 0.4.28 | 1 | 0 | 1,422 |
| **Relevance_foreign_managers** | Assets under management (AUM) by foreign managers to total AUM. | - | 0.2537 | 0 | 0.4147 | 1 | 0 | 1,311 |
| **Fund_type** | Dummy = 1 for closed funds. | + | 0.40 | 0 | 0.49 | 1.00 | 0 | 1,402 |
| **Nav** | Natural logarithm of the fund's NAV. | -/+ | 16.97 | 17 | 1.88 | 22.29 | 10.02 | 1,425 |
| **Net_contribution** | Annual net contribution to NAV. | - | 0.2654 | 0.2003 | 0.2105 | 2.8621 | -1.36 | 1,402 |
| **Benefits** | Annual pension benefits to NAV. | + | 0.0120 | 0.0063 | 0.0204 | 0.3315 | 0 | 1,402 |

**Table 4 - Descriptive statistics on the share of domestic sovereign bonds**

| | Entire sample | Guaranteed lines |
|---|---|---|
| **Y(1): Share of Italian sovereign bonds on UE sovereign exposure** | | |
| Mean | 0.5431 | 0.6474 |
| Median | 0.5056 | 0.6333 |
| Standard deviation | 0.3040 | 0.2731 |
| Max | 1 | 1 |
| Min | 0 | 0 |
| N. Obs. | 1426 | 519 |
| Mean difference (All - Guaranteed) | -0.1043*** | |
| **Y(2): Y(1) - Share of Italian debt on total UE area sovereign debt** | | |
| Mean | 0.3571 | 0.4620 |
| Median | 0.355 | 0.4447 |
| Standard deviation | 0.3035 | 0.2723 |
| Max | 0.8240 | 0.8240 |
| Min | -0.2108 | -0.2108 |
| N. Obs. | 1414 | 518 |
| Mean difference (All - Guaranteed) | -0.1049*** | |
| **Y(3): Y(1) - Share of Italian GDP on total UE area GDP** | | |
| Mean | 0.4208 | 0.5254 |
| Median | 0.3848 | 0.5100 |
| Standard deviation | 0.3038 | 0.2725 |
| Max | 0.8843 | 0.8843 |
| Min | -0.1279 | -0.1279 |
| N. Obs. | 1403 | 518 |
| Mean difference (All - Guaranteed) | -0.1046*** | |

**Table 5: Descriptive statistics on the share of domestic sovereign bonds by type of investment mandate (values in percentage)**

| | Entire sample | | Guaranteed lines | |
|---|---|---|---|---|
| **Y(1): Share of Italian sovereign bonds on UE sovereign exposure** | | | | |
| | Mean | Obs | Mean | Obs |
| Only Europe | 0.6472 | 349 | 0.6778 | 263 |
| All world | 0.5077 | 1053 | 0.6207 | 233 |
| Max equity <25% | 0.6193 | 457 | 0.6575 | 337 |
| Max equity >25% | 0.4923 | 658 | 0.6209 | 110 |
| Low and medium-low risk | 0.6012 | 614 | 0.6491 | 424 |
| Medium-high and high risk | 0.5093 | 435 | 0.6322 | 93 |
| **Y(2): Y(1) - Share of Italian debt on total UE area sovereign debt** | | | | |
| | Mean | Obs | Mean | Obs |
| Only Europe | 0.4600 | 349 | 0.4908 | 263 |
| All world | 0.3220 | 1053 | 0.4373 | 233 |
| Max equity <25% | 0.4338 | 457 | 0.4723 | 337 |
| Max equity >25% | 0.3061 | 658 | 0.4350 | 110 |
| Low and medium-low risk | 0.4156 | 614 | 0.4641 | 424 |
| Medium-high and high risk | 0.3227 | 435 | 0.4452 | 93 |
| **Y(3): Y(1) - Share of Italian GDP on total UE area GDP** | | | | |
| | Mean | Obs | Mean | Obs |
| Only Europe | 0.5244 | 349 | 0.5548 | 263 |
| All world | 0.3855 | 1053 | 0.4999 | 233 |
| Max equity <25% | 0.4973 | 457 | 0.5357 | 337 |
| Max equity >25% | 0.3699 | 658 | 0.4987 | 110 |
| Low and medium-low risk | 0.4792 | 614 | 0.5274 | 424 |
| Medium-high and high risk | 0.3868 | 435 | 0.5090 | 93 |

**Table 6: Descriptive statistics on the share of domestic sovereign bonds by year and type of investment mandate (values in percentage)**

| **Y(1): Share of Italian sovereign bonds on total sovereign exposure** | | | | | | | |
|---|---|---|---|---|---|---|---|
| | **2008** | **2009** | **2010** | **2011** | **2012** | **2013** | **2014** |
| Whole sample | 0,569 | 0,576 | 0,586 | 0,54 | 0,535 | 0,505 | 0,492 |
| Only Europe | 0,55 | 0,683 | 0,739 | 0,651 | 0,643 | 0,624 | 0,672 |
| All world | 0,584 | 0,533 | 0,528 | 0,497 | 0,495 | 0,462 | 0,462 |
| Low and medium-low risk | 0,595 | 0,656 | 0,683 | 0,605 | 0,576 | 0,558 | 0,548 |
| medium-high and high risk | 0,574 | 0,542 | 0,491 | 0,512 | 0,528 | 0,478 | 0,422 |
| **Y(2): Y(1) - Share of Italian debt on total UE area sovereign debt** | | | | | | | |
| | **2008** | **2009** | **2010** | **2011** | **2012** | **2013** | **2014** |
| Whole sample | 0,359 | 0,378 | 0,403 | 0,359 | 0,357 | 0,328 | 0,315 |
| Only Europe | 0,34 | 0,486 | 0,555 | 0,471 | 0,466 | 0,445 | 0,496 |
| All world | 0,375 | 0,335 | 0,345 | 0,318 | 0,318 | 0,285 | 0,285 |
| Low and medium-low risk | 0,386 | 0,458 | 0,5 | 0,426 | 0,398 | 0,38 | 0,371 |
| medium-high and high risk | 0,364 | 0,343 | 0,307 | 0,333 | 0,35 | 0,301 | 0,244 |
| **Y(3): Y(1) - Share of Italian GDP on total UE area GDP** | | | | | | | |
| | **2008** | **2009** | **2010** | **2011** | **2012** | **2013** | **2014** |
| Whole sample | 0,443 | 0,447 | 0,46 | 0,415 | 0,415 | 0,387 | 0,375 |
| Only Europe | 0,424 | 0,556 | 0,612 | 0,527 | 0,523 | 0,505 | 0,557 |
| All world | 0,459 | 0,405 | 0,401 | 0,374 | 0,376 | 0,345 | 0,345 |
| Low and medium-low risk | 0,47 | 0,528 | 0,558 | 0,481 | 0,455 | 0,440 | 0,432 |
| medium-high and high risk | 0,447 | 0,413 | 0,363 | 0,389 | 0,408 | 0,361 | 0,304 |

**Table 7 - Composition of the asset management team (values in percentage)**

| | Mean Y(1) | Mean Y(2) | Mean Y(3) |
|---|---|---|---|
| **Total number of fund managers** | | | |
| **1,00** | 0.5589 | 0.3728 | 0.4366 |
| **2,00** | 0.5383 | 0.3531 | 0.4163 |
| **3,00** | 0.4498 | 0.2634 | 0.3273 |
| **4,00** | 0.4884 | 0.3004 | 0.3659 |
| **5,00** | 0.4384 | 0.2542 | 0.3163 |
| **>5** | 0.3389 | 0.1562 | 0.2183 |
| **N. of foreign managers (in %)** | | | |
| **0%** | 0.5998 | 0.4202 | 0.3944 |
| **Between 0 and 50%** | 0.4939 | 0.3082 | 0.3715 |
| **Greater than 50%** | 0.4186 | 0.2340 | 0.2968 |
| **% of AUM managed by foreign managers** | | | |
| **0%** | 0.6012 | 0.3963 | 0.4785 |
| **Between 0 and 50%** | 0.4508 | 0.2663 | 0.3287 |
| **Greater than 50%** | 0.4113 | 0.2265 | 0.2894 |

**Table 8 – Result of the analysis**

Panel analysis with Y1 (Share of Italian sovereign bonds on UE sovereign exposure), Y2 (Y(1) - Share of Italian debt on total UE area sovereign debt) and Y3 (Y(1) - Share of Italian GDP on total UE area GDP) as dependent variables. Huber-White heteroscedasticity-consistent standard errors for specifications (4), (5), (6). * p<0.1; ** p<0.05; *** p<0.01

| | Y1 = IT Sov/UE Sov Bond | | | Y2 = Excess of IT Sov vs UE risk neutral portfolio (Hp 1) | | | Y3 = Excess of IT Sov vs UE risk neutral portfolio (Hp 2) | | |
|---|---|---|---|---|---|---|---|---|---|
| | (1) | (2) | (3) | (4) | (5) | (6) | (7) | (8) | (9) |
| Inv_area | -0,046 | -0,045 | -0,045 | -0,045 | -0,045 | -0,045 | -0,046 | -0,045 | -0,044 |
| | (1.80)* | (1.86)* | (1.93)* | (1.86)* | (1.88)* | (1.86)* | (1.80)* | (1.85)* | (1.86)* |
| Guarantee | 0,116 | 0,112 | 0,113 | 0,116 | 0,113 | 0,119 | 0,117 | 0,113 | 0,116 |
| | (2.63)*** | (2.69)*** | (3.15)*** | (2.60)*** | (2.63)*** | (3.27)*** | (2.65)*** | (2.72)*** | (3.24)*** |
| No_managers | -0,026 | -0,021 | -0,025 | -0,027 | -0,021 | -0,025 | -0,026 | -0,021 | -0,025 |
| | (1.51) | (1.58) | (1.86)* | (1.97)** | (2.13)** | (2.63)*** | (1.52) | (0.59) | (1.88)* |
| No_foreign_managers | | -0,001 | -0,001 | | -0,001 | -0,001 | | -0,001 | -0,001 |
| | | (4.47)*** | (5.37)*** | | (4.51)*** | (5.40)*** | | (4.45)*** | (5.29)*** |
| Relevance_foreing_managers | -0,001 | | | -0,001 | | | -0,001 | | |
| | (4.77)*** | | | (4.90)*** | | | (4.75)*** | | |
| Fund_type | -0,027 | -0,016 | 0,030 | -0,027 | -0,016 | 0,022 | -0,026 | -0,016 | 0,026 |
| | (0.63) | (0.42) | (0.8) | (0.67) | (0.45) | (0.62) | (0.62) | (0.41) | (0.7) |
| Nav | 0,018 | 0,018 | -0,002 | 0,019 | 0,019 | 0,004 | 0,019 | 0,019 | 0,000 |
| | (2.05)** | (2.21)** | -0,280 | (1.87)* | (1.99)** | -0,430 | (2.09)** | (2.25)** | -0,040 |
| Net_contribution | -0,070 | -0,073 | -0,034 | -0,071 | -0,074 | -0,049 | -0,071 | -0,073 | -0,035 |
| | (2.66)*** | (2.95)*** | -1,470 | (2.24)** | (2.47)** | (1.65)* | (2.67)*** | (2.96)*** | -1,530 |
| Benefits | 0,000 | 0,000 | 0,002 | 0,000 | 0,000 | 0,002 | 0,000 | 0,000 | 0,001 |
| | (0.01) | (0.1) | (0.45) | (0.01) | (0.11) | (0.52) | (0.03) | (0.13) | (0.41) |
| Intercept | 0,414 | 0,411 | 0,633 | 0,201 | 0,199 | 0,353 | 0,280 | 0,279 | 0,469 |
| | (2.76)*** | (2.94)*** | (5.15)*** | (1.19) | (1.24) | (2.54)** | (1.87)* | (1.99)** | (3.81)*** |
| Line-FE | YES | YES | NO | YES | YES | NO | YES | YES | NO |
| Time FE | YES | YES | NO | YES | YES | NO | YES | YES | NO |
| Prob>Chi2 | 0,000 | 0,000 | 0,000 | 0,000 | 0,000 | 0,000 | 0,000 | 0,000 | 0,000 |
| R-squared | 0,160 | 0,160 | 0,118 | 0,158 | 0,156 | 0,126 | 0,158 | 0,158 | 0,121 |
| Observatios | 1221 | 1331 | 1363 | 1220 | 1330 | 1362 | 1220 | 1330 | 1362 |

**Table No. 9 – Results of the analysis on guaranteed lines**

Panel analyses with Y1 (Share of Italian sovereign bonds on UE sovereign exposure), Y2 (Y(1) - Share of Italian debt on total UE area sovereign debt) and Y3(Y(1) - Share of Italian GDP on total UE area GDP) as dependent variables. In column (1), (2), (3) Huber-White heteroscedasticity-consistent standard errors in parenthesis. * p<0.1; ** p<0.05; *** p<0.01

| | Guaranteed lines | | |
|---|---|---|---|
| | Y1 | Y2 | Y3 |
| | (1) | (2) | (3) |
| Inv_area | -0,061 | -0,060 | -0,060 |
| | (2.36)** | (2.34)** | (2.35)** |
| Guarantee_type | 0,067 | 0,066 | 0,067 |
| | (1.90)* | (1.86)* | (1.89)* |
| Discretional_choice | -0,069 | -0,068 | -0,068 |
| | (1.87)* | (1.84)* | (1.83)* |
| No_managers | -0,108 | -0,108 | -0,109 |
| | (1.55) | (1.55) | (1.55) |
| Relevance_foreing_managers | -0,001 | -0,001 | -0,001 |
| | (2.52)** | (2.49)** | (2.49)** |
| Fund_type | -0,022 | -0,021 | -0,021 |
| | (0.36) | (0.35) | (0.34) |
| Nav | 0,011 | 0,011 | 0,011 |
| | (0.73) | (0.75) | (0.77) |
| Net_contribution | -0,152 | -0,154 | -0,153 |
| | (3.13)*** | (3.13)*** | (3.13)*** |
| Benefits | 0,003 | 0,003 | 0,003 |
| | (0.61) | (0.62) | (0.62) |
| Intercept | 0,747 | 0,532 | 0,611 |
| | (3.20)*** | (2.28)** | (2.63)*** |
| Line FE | YES | YES | YES |
| Time FE | YES | YES | YES |
| Prob>Chi2 | 0,000 | 0,000 | 0,000 |
| R-squared | 0,151 | 0,144 | 0,146 |
| Observatios | 475 | 474 | 474 |

## Table 10 – Results by investment line

Panel analyses with Y1 (Share of Italian sovereign bonds on UE sovereign exposure), Y2 (Y(1) - Share of Italian debt on total UE area sovereign debt) and Y3(Y(1) - Share of Italian GDP on total UE area GDP) as dependent variables. In column (1), (2), (3), (7), (8), (9) Huber-White heteroscedasticity-consistent standard errors in parenthesis. Fund type is dropped from the medium-low and the low risk lines for collinearity.
* p<0.1; ** p<0.05; *** p<0.01

| | low risk lines | | | medium-low risk lines | | | medium risk lines | | | medium-high risk lines | | | high risk lines | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Y1 | Y2 | Y3 | Y1 | Y2 | Y3 | Y1 | Y2 | Y3 | Y1 | Y2 | Y3 | Y1 | Y2 | Y3 |
| | (1) | (2) | (3) | (4) | (5) | (6) | (7) | (8) | (9) | (10) | (11) | (12) | (13) | (14) | (15) |
| Inv_area | -0,077 | -0,076 | -0,076 | -0,104 | -0,100 | -0,101 | -0,129 | -0,128 | -0,126 | -0,276 | -0,277 | -0,276 | -0,081 | -0,080 | -0,080 |
| | (2.47)** | (2.46)** | (2.45)** | (1.22) | (1.17) | (1.19) | (1.90)* | (1.89)* | (1.86)* | (1.46) | (1.46) | (1.46) | (0.38) | (0.38) | (0.38) |
| Guarantee | 0,193 | 0,191 | 0,192 | 0,155 | 0,166 | 0,166 | 0,106 | 0,107 | 0,105 | 0,099 | 0,098 | 0,099 | 0,035 | 0,034 | 0,036 |
| | (2.33)** | (2.31)** | (2.32)** | -1,620 | (1.73)* | (1.72)* | (0.91) | (0.92) | (0.9) | (0.48) | (0.47) | (0.48) | (0.14) | (0.13) | (0.14) |
| Max_Equity | -0,003 | -0,003 | -0,003 | -0,001 | -0,001 | -0,001 | -0,001 | -0,001 | -0,001 | -0,001 | -0,001 | -0,001 | -0,003 | -0,003 | -0,003 |
| | (1.25) | (1.25) | (1.24) | (0.75) | (0.79) | (0.78) | (0.65) | (0.64) | (0.66) | (0.81) | (0.79) | (0.84) | (3.12)*** | (3.12)*** | (3.12)*** |
| No_managers | -0,025 | -0,025 | -0,025 | -0,020 | -0,018 | -0,018 | -0,047 | -0,047 | -0,047 | -0,097 | -0,096 | -0,097 | 0,007 | 0,008 | 0,006 |
| | (0.68) | (0.7) | (0.7) | (0.45) | (0.42) | (0.42) | (2.45)** | (2.45)** | (2.44)** | (2.13)** | (2.12)** | (2.14)** | (0.07) | (0.08) | (0.06) |
| Relevance_foreing_managers | -0,001 | -0,001 | -0,001 | 0,000 | 0,000 | 0,000 | 0,000 | 0,000 | 0,000 | -0,002 | -0,002 | -0,002 | -0,002 | -0,002 | -0,002 |
| | (1.71)* | (1.72)* | (1.70)* | (0.66) | (0.48) | (0.46) | (0.3) | (0.32) | (0.32) | (3.57)*** | (3.56)*** | (3.56)*** | (2.05)** | (2.07)** | (2.06)** |
| Fund_type | 0,030 | 0,030 | 0,030 | | | | | | | 0,042 | 0,042 | 0,043 | -0,181 | -0,182 | -0,178 |
| | (0.4) | (0.39) | (0.39) | | | | | | | (0.49) | (0.48) | (0.49) | (0.83) | (0.84) | (0.82) |
| Nav | 0,021 | 0,021 | 0,021 | 0,019 | 0,019 | 0,019 | 0,041 | 0,041 | 0,041 | 0,032 | 0,032 | 0,032 | -0,049 | -0,049 | -0,049 |
| | (1.06) | (1.06) | (1.09) | (0.86) | (0.82) | (0.83) | (1.63) | (1.63) | (1.61) | (1.59) | (1.62) | (1.59) | (1.71)* | (1.71)* | (1.72)* |
| Net_contribution | -0,088 | -0,087 | -0,087 | -0,076 | -0,090 | -0,091 | -0,049 | -0,049 | -0,047 | 0,034 | 0,035 | 0,035 | -0,009 | -0,008 | -0,010 |
| | (1.72)* | (1.70)* | (1.70)* | (0.77) | (0.9) | (0.92) | (0.47) | (0.47) | (0.45) | (0.61) | (0.63) | (0.64) | (0.11) | (0.1) | (0.13) |
| Benefits | 0,023 | 0,023 | 0,023 | -0,003 | -0,004 | -0,004 | -0,003 | -0,003 | -0,002 | -0,014 | -0,015 | -0,015 | 0,007 | 0,006 | 0,007 |
| | (2.88)*** | (2.87)*** | (2.87)*** | (0.63) | (0.68) | (0.7) | (0.58) | (0.59) | (0.56) | (0.67) | (0.69) | (0.68) | (0.21) | (0.2) | (0.22) |
| Intercept | 0,229 | 0,016 | 0,094 | 0,405 | 0,207 | 0,247 | 0,098 | -0,113 | -0,149 | 0,338 | 0,412 | 0,548 | 1,470 | 1,679 | 1,554 |
| | (0.69) | (0.05) | (0.28) | (1.09) | (0.56) | (0.66) | (0.23) | (0.27) | (0.36) | (0.91) | (1.11) | (1.47) | (2.91)*** | (3.32)*** | (3.08)*** |
| Line FE | n.a. | n.a. | n.a. | n.a. | n.a. | n.a. | n.a. | n.a. | n.a. | n.a. | n.a. | n.a. | n.a. | n.a. | n.a. |
| Time FE | YES | YES | YES | YES | YES | YES | YES | YES | YES | YES | YES | YES | YES | YES | YES |
| Prob>Chi2 | 0,000 | 0,000 | 0,000 | 0,004 | 0,015 | 0,001 | 0,006 | 0,027 | 0,023 | 0,000 | 0,000 | 0,000 | 0,000 | 0,000 | 0,000 |
| R-squared | 0,195 | 0,197 | 0,193 | 0,218 | 0,210 | 0,216 | 0,194 | 0,190 | 0,190 | 0,216 | 0,202 | 0,213 | 0,212 | 0,212 | 0,212 |
| Observatios | 332 | 332 | 332 | 124 | 123 | 123 | 230 | 230 | 230 | 211 | 211 | 211 | 168 | 168 | 168 |

**Table No. 11 – Results of the analysis by year**

OLS regression with Y2 (Y(1) - Share of Italian debt on total UE area sovereign debt) as dependent variable. Robust standard errors in parenthesis for columns (1), (2), (3). * p<0.1; ** p<0.05; *** p<0.01

| | 2008 | 2009 | 2010 | 2011 | 2012 | 2013 | 2014 |
|---|---|---|---|---|---|---|---|
| | (1) | (2) | (3) | (4) | (5) | (6) | (7) |
| Inv_area | 0,084 | -0,029 | -0,039 | -0,058 | -0,087 | -0,108 | -0,14 |
| | (1.13) | (0.50) | (0.71) | (1.00) | (1.39) | (1.83)* | (1.93)* |
| Guarantee | 0,194 | 0,21 | 0,191 | 0,058 | 0,035 | 0,039 | 0,051 |
| | (2.65)*** | (3.74)*** | (3.73)*** | (0.94) | (0.53) | (0.59) | (0.72) |
| No_managers | -0,033 | 0,01 | -0,004 | -0,023 | -0,004 | -0,023 | -0,023 |
| | (1.14) | (0.28) | (0.14) | (0.67) | (0.09) | (0.76) | (0.84) |
| Relevance_foreing_managers | -0,002 | -0,001 | -0,002 | -0,001 | -0,002 | -0,001 | -0,001 |
| | (2.54)** | (1.71)* | (3.87)*** | (2.65)*** | (3.54)*** | (2.44)** | (1.62) |
| Fund_type | -0,063 | 0,006 | -0,01 | -0,015 | -0,099 | -0,052 | -0,049 |
| | (0.84) | (0.11) | (0.21) | (0.26) | (1.58) | (0.86) | (0.79) |
| Nav | 0,02 | 0,016 | 0,036 | 0,011 | 0,021 | 0,013 | 0,026 |
| | (1.07) | (0.92) | (2.37)** | (0.68) | (1.29) | (0.87) | (1.71)* |
| Net_contribution | -0,039 | -0,143 | 0,044 | -0,155 | -0,156 | 0,000 | 0,135 |
| | (0.52) | (1.93)* | (0.57) | (0.75) | (0.88) | | (0.47) |
| Benefits | 0,009 | 0,005 | 0,006 | 0,003 | 0,003 | 0,002 | 0,02 |
| | (0.77) | (1.03) | (0.65) | (0.24) | (0.21) | (0.14) | (1.03) |
| Intercept | 0,006 | 0,098 | -0,154 | 0,315 | 0,191 | 0,276 | 0,119 |
| | (0.02) | (0.33) | (0.57) | (1.23) | (0.71) | (1.09) | (0.45) |
| *Line FE* | YES | YES | YES | YES | YES | YES | YES |
| *Prob>F* | 0,000 | 0,000 | 0,000 | 0,001 | 0,001 | 0,001 | 0,000 |
| $R^2$ | 0,14 | 0,20 | 0,34 | 0,18 | 0,17 | 0,17 | 0,22 |
| *N* | 177 | 179 | 170 | 175 | 179 | 174 | 166 |

**Table 12 – Restricting the investment area to the euro area: regression results**

Panel analysis with Y4 (Y(1) - Share of Italian debt on total euro area sovereign debt) and Y5 (Y(1) - Share of Italian GDP on total euro area GDP) as dependent variables. Robust standard errors in parenthesis for columns (3), (4). * p<0.1; ** p<0.05; *** p<0.01

| Explanatory variables | Whole sample | | Guaranteed lines | |
|---|---|---|---|---|
| | Y4 | Y5 | Y4 | Y5 |
| | (1) | (2) | (3) | (4) |
| Inv_area | -0,045 | -0,046 | -0,059 | -0,061 |
| | (1.78)* | (1.80)* | (2.32)** | (2.35)** |
| Guarantee | 0,116 | 0,116 | | |
| | (2.64)*** | (2.64)*** | | |
| Guarantee_type | | | 0,067 | 0,068 |
| | | | (1.91)* | (1.91)* |
| Discretional_choice | | | -0,068 | -0,068 |
| | | | (1.83)* | (1.83)* |
| No_managers | -0,027 | -0,027 | -0,109 | -0,11 |
| | (1.53) | (1.53) | (1.56) | (1.57) |
| Relevance_foreing_managers | -0,001 | -0,001 | -0,001 | -0,001 |
| | (4.74)*** | (4.73)*** | (2.46)** | (2.46)** |
| Fund_type | -0,026 | -0,026 | -0,02 | -0,02 |
| | (0.62) | (0.62) | (0.32) | (0.32) |
| Nav | 0,018 | 0,019 | 0,011 | 0,011 |
| | (2.06)** | (2.06)** | (0.73) | (0.73) |
| Net_contribution | -0,07 | -0,071 | -0,154 | -0,153 |
| | (2.66)*** | (2.66)*** | (3.15)*** | (3.12)*** |
| Benefits | 0 | 0 | 0,003 | 0,002 |
| | (0.01) | (0.03) | (0.62) | (0.59) |
| Intercept | 0,159 | 0,241 | 0,493 | 0,578 |
| | (1.07) | -1,61 | (2.11)** | (2.48)** |
| Line-FE | YES | YES | YES | YES |
| Time FE | YES | YES | YES | YES |
| Prob>Chi2 | 0,000 | 0,000 | 0,000 | 0,000 |
| R-squared | 0,158 | 0,158 | 0,1462 | 0,1462 |
| Observatios | 1.220 | 1.220 | 474 | 474 |

**Table 13 – Restricting the investment area to the euro area: regressions results by investment line**

Panel analysis with Y4 (Y(1) - Share of Italian debt on total euro area sovereign debt) and Y5 (Y(1) - Share of Italian GDP on total euro area GDP) as dependent variables. Robust standard errors in parenthesis for columns (1), (2), (5), (6). * p<0.1; ** p<0.05; *** p<0.01

| | low risk lines | | medium-low risk lines | | medium risk lines | | medium-high risk lines | | high risk lines | |
|---|---|---|---|---|---|---|---|---|---|---|
| | Y4 | Y5 | Y4 | Y5 | Y4 | Y5 | Y4 | Y5 | Y4 | Y5 |
| | (1) | (2) | (3) | (4) | (5) | (6) | (7) | (8) | (9) | (10) |
| Inv_area | -0,076 | -0,077 | -0,099 | -0,101 | -0,126 | -0,128 | -0,276 | -0,277 | -0,081 | -0,08 |
| | (2.45)** | (2.48)** | (1.17) | (1.19) | (1.86)* | (1.89)* | (1.45) | (1.46) | (0.38) | (0.38) |
| Guarantee | 0,192 | 0,192 | 0,166 | 0,166 | 0,105 | 0,106 | 0,10 | 0,098 | 0,036 | 0,035 |
| | (2.32)** | (2.32)** | (1.73)* | (1.72)* | (0.9) | (0.91) | (0.48) | (0.47) | (0.14) | (0.14) |
| Max_Equity | -0,003 | -0,003 | -0,001 | -0,001 | -0,001 | -0,001 | -0,001 | -0,001 | -0,003 | -0,003 |
| | (1.26) | (1.26) | (0.79) | (0.78) | (0.66) | (0.65) | (0.84) | (0.82) | (3.11)*** | (3.12)*** |
| No_managers | -0,026 | -0,026 | -0,018 | -0,018 | -0,047 | -0,048 | -0,097 | -0,097 | 0,007 | 0,007 |
| | (0.71) | (0.71) | (0.41) | (0.42) | (2.44)** | (2.46)** | (2.14)** | (2.13)** | (0.07) | (0.07) |
| Relevance_foreing_managers | -0,001 | -0,001 | 0,000 | 0,000 | 0,000 | 0,000 | -0,002 | -0,002 | -0,002 | -0,002 |
| | (1.70)* | (1.67)* | (0.47) | (0.46) | (0.32) | (0.32) | (3.59)*** | (3.55)*** | (2.03)** | (2.07)** |
| Fund_type | 0,03 | 0,031 | | | | | 0,043 | 0,043 | -0,182 | -0,182 |
| | (0.4) | (0.41) | | | | | (0.5) | (0.5) | (0.84) | (0.84) |
| Nav | 0,021 | 0,021 | 0,019 | 0,019 | 0,041 | 0,041 | 0,032 | 0,032 | -0,049 | -0,049 |
| | (1.06) | (1.06) | (0.83) | (0.83) | (1.61) | (1.63) | (1.58) | (1.61) | (1.71)* | (1.71)* |
| Net_contribution | -0,089 | -0,088 | -0,088 | -0,091 | -0,047 | -0,048 | 0,035 | 0,036 | -0,009 | -0,008 |
| | (1.74)* | (1.71)* | (0.88) | (0.92) | (0.45) | (0.46) | (0.63) | (0.65) | (0.11) | (0.10) |
| Benefits | 0,023 | 0,023 | -0,004 | -0,004 | -0,002 | -0,003 | -0,014 | -0,014 | 0,007 | 0,006 |
| | (2.85)*** | (2.86)*** | (0.65) | (0.70) | (0.56) | (0.59) | (0.66) | (0.68) | (0.22) | (0.20) |
| Intercept | -0,023 | 0,059 | 0,162 | 0,247 | -0,149 | -0,071 | 0,299 | 0,37 | 1,428 | 1,508 |
| | (0.07) | (0.18) | (0.43) | (0.66) | (0.36) | (0.17) | (0.8) | (0.99) | (2.82)*** | (2.98)*** |
| Line FE | n.a. | n.a. | n.a. | n.a. | n.a. | n.a. | n.a. | n.a. | n.a. | n.a. |
| Time FE | YES | YES | YES | YES | YES | YES | YES | YES | YES | YES |
| Prob>Chi2 | 0,000 | 0,000 | 0,009 | 0,006 | 0,023 | 0,008 | 0,000 | 0,000 | 0,000 | 0,000 |
| R-squared | 0,197 | 0,193 | 0,216 | 0,216 | 0,19 | 0,194 | 0,206 | 0,212 | 0,211 | 0,212 |
| Observatios | 332 | 332 | 123 | 123 | 230 | 230 | 211 | 211 | 168 | 168 |