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"Home Bias of Eurozone Banks during the Financial and Sovereign Crisis"

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Abstract

This paper uncovers two characteristics concerning cross-border bank positions for securities other than shares in the euro zone. First, the home bias for securities other than shares in the balance sheet of euro zone banks increased after the financial crisis of 2008. Second, the home bias in countries where governments face financial distress increases even further. The rise of the home bias can be explained by the theory on secondary markets of sovereign debt and information frictions. A high home bias has important policy implications for the Eurozone and re-intensifies the need for addressing the link between sovereigns and banks in the Eurozone with decisive policy actions.

Keywords: Secondary Markets, Information Frictions, Sovereign Crisis, Sovereign Risk, Portfolio Home Bias, Bank-sovereign Interdependence

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1. Introduction

The financial crisis and Eurozone sovereign crisis have been associated with a decrease of cross-border financial flows among Euro area countries[1]. The motives for the change in cross-border financial flows are likely to differ between the two crises. A usual explanation provided by economic literature concerns foreign investors higher sensitivity for information asymmetries[2]. The present paper analyzes the evolution of the home bias in the balance sheet of Eurozone monetary and financial institutions[3] resulting from the change in cross-border financial flows starting from the pre-crisis years until the current sovereign crisis. Our findings have important implications for policy makers, especially in the light of the current institutional challenges the Eurozone faces.

Our research focuses on the holdings of securities and shares by Eurozone MFIs. Debt securities are the most common form of funding for sovereigns and together with equity securities represent the main source of foreign funding in the Eurozone[4]. The European market for debt securities is very well established and has important aspects for financial integration and risk dispersion. For simplicity reasons this paper will subsequently refer to the home bias always in the context of the holdings of securities other than shares by Eurozone MFIs.

The present paper reveals three importance aspects regarding the linkage of sovereign yield and home bias in the debt securities' portfolio of Eurozone banks. First, a rise in the yield of a sovereign results in an increase of the home bias indicator for the banks located in

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[1] See The European Financial Stability and Integration Report 2011 (2012) and ECB Monthly Bulletin February 2012.

[2] Fidora, M., Fratzscher, M. and Thimann, C., "Home bias in global bond and equity markets: the role of real exchange rate volatility", Journal of International Money and Finance, Vol. 26, No 4, 2007, pp. 631-655; and Gelos, R.G. and Wei, S-J., "Transparency and International Portfolio Holdings", Journal of Finance, Vol. 60, No 6, 2005, pp. 2987-3020

[3] See regulation ECB/2008/32: *"Monetary financial institution" (MFI) means a resident credit institution as defined in Community law, or another resident financial institution whose business is to receive deposits and/or close substitutes for deposits from entities other than MFIs and, for its own account (at least in economic terms), to grant credits and/or make investments in securities.*

[4] European Central Bank (2012), Euro-area Cross Border Financial Flows, *Monthly Bulletin*.

the jurisdiction of the sovereign. Second, the financial crisis amplified this causality. We argue that information frictions are the main component driving the increase after the financial crisis as MFIs substitute foreign private sector securities against domestic ones. Third, the sovereign crisis further increases the yield to home bias linkage. Banks residing in a country that faces financial distress increase their share of domestic government securities compared to other securities. The secondary market theory provides a plausible explanation for this phenomenon. Sovereigns have a higher incentive to default on foreign debt, thus foreign investors sell such securities on a secondary market in order to limit their exposure. Since local MFIs are not affected by the default risk in the same way they buy these securities in search for profit opportunities and thus increase their home bias.

Our paper falls into the broader research on sovereign risk and stands out by the use of a home bias indicator across all individual Eurozone countries[5] and the comprehensive, timely dataset of MFI balance sheet statistics by the ECB. We provide empirical support for the branch of literature that views sovereign default risk not from the perspective of missing penalty, but rather as one of missing market. However, the stabilizing effect on the financial situation of a sovereign through an increasing MFI home bias also carries the risk of higher bank and sovereign dependency. We thus similarly enrich the literature focusing on the linkages between sovereign and banking crisis with empirical evidence for the Eurozone.

The remainder of the paper is structured as follows. In section 2 we review the benefits and risks associated with an increasing home bias. Section 3 introduces the empirical framework and data used in our research. Section 4 presents the results and related theories. Section 5 discusses caveats of our analysis and policy implications. Section 6 then concludes.

2. Portfolio Home Bias During a Sovereign Crisis

The introduction of the Euro eliminated exchange rate risks and introduced the legal

[5] Only Estonia has been exempted from the analysis due to limited data availability.

requirement for treating euro-denominated bonds the same as national bonds. As expected the pattern of a decreasing home bias is visible for our indicator. Until 2006 the weighted average Eurozone home bias decreased steadily hinting at deeper financial integration due to a common currency. This observation is in line with the findings by Lane (2005) and Ways, Ross and de Guzman (2010). Lane (2005) reveals that there is a shift taking place from "home bias" to "Eurozone bias". In other words, bond portfolios are invested disproportionately high in the Eurozone compared to rest of the world. Ways, Ross and de Guzman (2010) point to the fact that much of the cross-border investments are made from the high-saving Eurozone member states to those with a low savings rate.

Another important observation is that the design of a monetary union implies that countries in the Eurozone issue debt in a currency whose exchange rate they do not fully control. De Grauwe (2011) and Kopf (2011) highlight that under such circumstances a loss of confidence of investors can trigger a self-fulfilling spiral leading a country into default. If investors fear a default, they sell government debt. Since there is no exchange rate to counterbalance the flight of capital, there is a direct effect on the interest rate of the government bonds. The flight of capital results in a shrinkage of the money supply and a country may face a liquidity crisis. The sudden increase in the interest rate can then in turn trigger a solvency crisis. Depending on the home bias of MFIs in the respective country a banking crisis can follow. In absolute terms the home bias of Eurozone MFIs is rather large and exposes banks substantially to domestic sovereign risk. Thus the sovereign-bank-interdependence may trigger a banking crisis in response to a sovereign crisis.

Broner, Martin and Ventura (2010) provide an alternative view on a sovereign crisis. Their research is based on the premise that domestic and foreign investors value the default risk of a sovereign differently. Assume that a chance arises for a sovereign to default on its debt. The sovereign will have a higher incentive to default on foreign debt versus domestic

debt since the government knows that a default on domestic debt has higher direct economic consequences. Foreign investors anticipate this and sell their securities below the pre-crisis price. In the presence of a proper functioning secondary market domestic investors buy these securities in search for profit opportunities, as their risk of default is lower. In a competitive market securities will thus move from foreign to domestic investors as agents optimize their portfolio. As a result the yield of the sovereign will reflect the risk domestic investors are facing instead of foreign investors. This is based on the fact that when domestic investors hold a large amount of a government's debt, the government is more inclined to follow a sustainable financial path. On the one hand, the secondary market theory predicts that an increase in the home bias can counter balance a mounting sovereign crisis. On the other hand, the shift from foreign to domestic concentrates the default risk within national borders and intensifies the dependency between domestic sovereign and bank solvency. In other words, the secondary market may lower the probability of a sovereign crisis, yet raises economic costs of a twin crisis. Moreover, as supervision of banks is ultimately sovereign responsibility there are stronger incentives for crisis countries to apply lax supervisory standards on their domestic banking system.

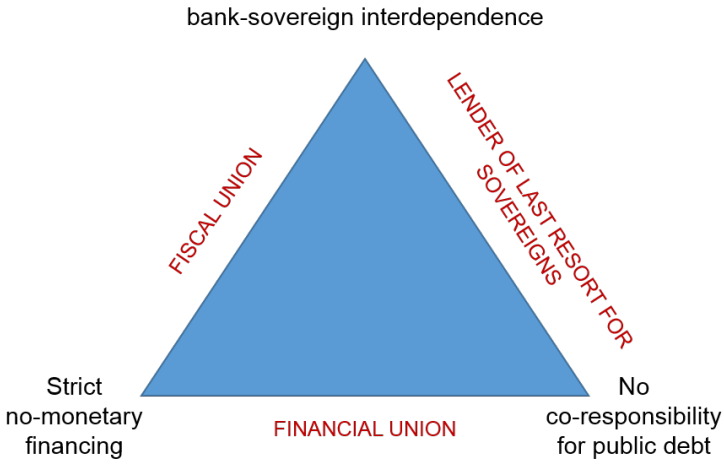
The decision to form a single supervisory mechanism (SSM) led by the European Central Bank (ECB) is an essential step in order to address these concerns. Yet, even under a common supervisory framework the interdependence between domestic banks and sovereign countries remains. Pisani-Ferry (2012) illustrates the challenges of the institutions design in the Eurozone well with the so-called "new trilemma" as depicted in figure 1.

In the terminology of figure 1 the Eurozone is currently moving towards a financial union. Consequently it is exposed to bank-sovereign interdependence. Alternative policies are

a fiscal union or the ECB acting as lender of last resorts. Article 125[6] of the Lisbon Treaty rules out the former, and Article 123[7] of the European Union treaty the latter. The European Central Bank is prohibited to directly finance governments in the European Union. However, it retains the option of buying government debt on secondary markets.

Under the Securities Market Program (SMP) the ECB actually purchased Greek, Portuguese, Spanish and Italian government bonds. However, the ECB acted on the grounds of restoring the monetary transmission mechanism rather than assisting sovereigns under financial distress. Thus, the trilemma remains and the risk of bank-sovereign interdependence must be a concern for policy makers, supervisors and politicians in the Eurozone.

Figure 1: New Trilemma by Pisani-Ferry (2012), Bruegel



source: Pisani-Ferry (2012), Bruegel Policy Contribution.

[6] Treaty of Lisbon, Art. 125, 2007: *"The Union shall not be liable for or assume the commitments of central governments, regional, local or other public authorities, other bodies governed by public law, or public undertakings of any Member State, without prejudice to mutual financial guarantees for the joint execution of a specific project. A Member State shall not be liable for or assume the commitments of central governments, regional, local or other public authorities, other bodies governed by public law, or public undertakings of another Member State, without prejudice to mutual financial guarantees for the joint execution of a specific project".*

[7] Treaty of Lisbon, Art. 123, 2007: "*"Overdraft facilities or any other type of credit facility with the European Central Bank or with the central banks of the Member States (hereinafter referred to as 'national central banks') in favour of Union institutions, bodies, offices or agencies, central governments, regional, local or other public authorities, other bodies governed by public law, or public undertakings of Member States shall be prohibited, as shall the purchase directly from them by the European Central Bank or national central banks of debt instruments"*

3. Empirical Framework and Data

In this section, the strategy for formally testing the change in home bias is laid out. First the empirical framework is introduced, followed by an overview of the home bias in the Eurozone and dataset used for analysis.

3.1 An Indicator for Home Bias

The indicator for home bias is based on Manna (2004). It measures the excess domestic business of monetary and financial institutions (MFIs) compared to domestic business under the assumption of no preference between domestic and foreign counterparty. Put differently, it measures the additional domestic business MFIs conduct to the level estimated under neutrality. In our research we apply the indicator on the asset class "securities other than shares" as defined by the ECB's MFI balance sheet statistics. "Securities other than shares, {…}, are securities which are negotiable and can be traded on secondary markets, or can anyway be sold on the market, and which do not grant the holder any ownership rights over the issues."[8] In this regard the research distinguishes itself on the instrument level from the analysis on debt repatriation by Brutti and Saure (2013) who focus on the asset class *claims.* In general claims include loans, securities and shares.

3.2 The Algebra of the Home Bias Indicator

Before using the home bias indicator in our model we need to take a closer look at the algebra behind it. At each quarter for the balance-sheet category "securities other than shares" we avail of a symmetric i x j matrix X^{euro}. The column i represents the euro zone country the MFI is resident in and row j is the euro zone country the counterparty is located. In the case of securities other than shares this is the issuer of the security. For simplicity we omit the time index in our formula. Since the euro zone has seen enlargements over the observation time the matrix has in fact different dimensions over time. At every time t we specify for resident

[8] European Central Bank (2011), Manual on MFI balance sheet statistics, p.72;

country i and counterparty j the instrument securities other than shares as the following row/column/matrix:

$$x_{i,\cdot} = \sum_{j=1}^{n} x_{i,j} \qquad i = 1, \dots, n$$

$$x_{\cdot,j} = \sum_{i=1}^{n} x_{i,j} \qquad j = 1, \dots, n$$

$$x_{\cdot,\cdot} = \sum_{i=1}^{n}\sum_{j=1}^{n} x_{i,j} = \sum_{i=1}^{n} x_{i,\cdot} = \sum_{j=1}^{n} x_{\cdot,j}$$

The size of the matrix changes over the observation period as illustrated in the following table:

Date	Euro zone countries	n
03Q1 - 06Q4	BE, DE, FI, FR, IE, IT, LU, NL, AT, PT, ES, GR	12
07Q1 – 07Q4	+ SI	13
08Q1 – 08Q4	+ CY + MT	15
09Q1 – 10Q4	+ SK	16
11Q1 – 13Q2	+ EE	17

Variable $x_{i,\cdot}$ stands for the outstanding securities other than shares in the MFI balance sheets of country i vis-à-vis all other euro zone countries including country i itself. Conversely, $x_{\cdot,j}$ stands for all securities other than shares held by euro zone MFIs, including those of country j, vis-a-vis country j. Thus $x_{\cdot,\cdot}$ represents euro zone's MFI holdings of securities other than shares issued by entities resident in the euro zone.

The indicator for home bias for country i is defined as:

$$I_1(i) = \left(x_{i,i} - \frac{x_{i,\cdot}x_{\cdot,i}}{x_{\cdot,\cdot}}\right)\frac{1}{x_{i,\cdot}} = \frac{x_{i,i}}{x_{i,\cdot}} - \frac{x_{\cdot,i}}{x_{\cdot,\cdot}} \epsilon \left[-\frac{x_{\cdot,i}}{x_{\cdot,\cdot}}, 1 - \frac{x_{\cdot,i}}{x_{\cdot,\cdot}}\right] > 0 \; or < 0$$

The lower and upper bound of the interval is characterized by the extreme cases of no domestic business at all and only domestic business. When $x_{i,i} = x_{i,\cdot}$ then MFIs in country i

hold only domestically issued securities from the non-MFI sector. The upper limit for the home bias is then defined as $1 - \frac{x_{\cdot,i}}{x_{\cdot,\cdot}}$. When $x_{i,i} = 0 \; and \; x_{i,\cdot} > 0$ then the lower limit is defined as $-\frac{x_{\cdot,i}}{x_{\cdot,\cdot}}$. In this case the MFIs hold exclusively non-domestically issued securities.

The equivalent for the euro area is:

$$I_2 = \sum_{i=1}^{n} \left(x_{i,i} - \frac{x_{i,\cdot} x_{\cdot,i}}{x_{\cdot,\cdot}} \right) \frac{1}{x_{\cdot,\cdot}} = \frac{1}{x_{\cdot,\cdot}} \sum_{i=1}^{n} \left[x_{i,\cdot} \; I(i) \right] > 0 \; or < 0$$

The indicator for country i measures the excess of the actual domestic business compared with the domestic business carried out under the assumption of no-country preference. The ratio $\left(\frac{x_{i,\cdot} \, x_{\cdot,j}}{x_{\cdot,\cdot}} \right)$ is used to replicate neutrality in bi-dimensional characters for the generic cell of position (i,j). Thus the ratio $\left(\frac{x_{i,\cdot} \, x_{\cdot,i}}{x_{\cdot,\cdot}} \right)$measures the amount of domestic activity undertaken when there is neutrality with respect to the euro area country of the counterparty (domestic vs. foreign) for country i.

The euro area wide indicator for home bias is the weighted sum of the country indicators. Every country is weighted by $\left(\frac{x_{i,\cdot}}{x_{\cdot,\cdot}} \right)$ which is the size of outstanding amounts of country i vis-à-vis all euro zone countries to total euro zone outstanding amounts vis-à-vis euro zone countries.

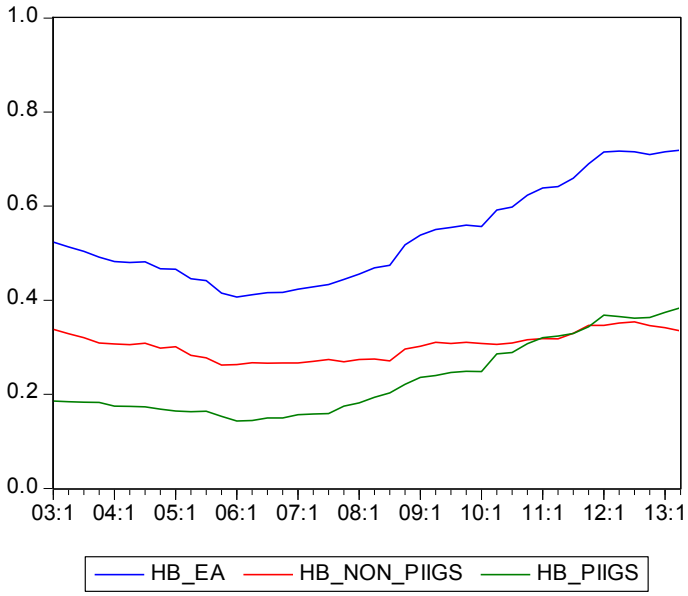
3.3 An Overview of the Home Bias Indicator in the Eurozone

Chart 1 illustrates the home bias for asset class securities other than shares and reporting sector monetary and financial institutions (MFIs). We split the home bias into two groups: Portugal, Ireland, Italy, Greece and Spain (PIIGS) and the other euro zone countries (non-PIIGS).

Chart 1 shows that in the pre-crisis years the home bias steadily decreased. For the euro zone as a whole it reached a minimum of 0.4 around 2006. In other words, the excess

domestic business accounted for 40% of the domestic business under the assumption of neutrality between home vs. euro area. The financial crisis and subsequent sovereign crisis push this measure up to 70% by early 2012. The weighted home bias for the euro zone thus increases during the crises years. MFIs were in relative terms increasing their holdings of domestically issued securities other than shares in comparison to those issued by other euro zone countries. To be precise here, we do not analyze the effect of securities issued by countries outside the euro area due to limited data availability.

Chart 1: Home bias for the Eurozone and PIIGS - non-PIIGS decomposition, MFI reporting sector

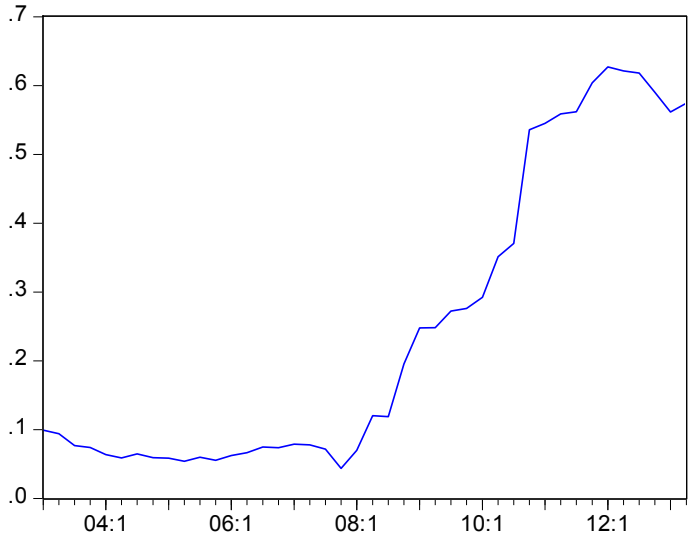


Another observable aspect is that the PIIGS countries saw in relative terms a stronger increase compared to non-PIIGS countries after 2007Q2. This pattern would support the secondary market theory. Foreign investors sell securities issued by a country in a sovereign crisis below market price due to the country's higher incentive to default on foreign debt. Domestic MFIs then buy these securities in order to seize profit opportunities.

Since the indicator is a weighted average the results vary largely across the different countries. Among the PIIGS countries Ireland and Greece have a very distinct evolution of

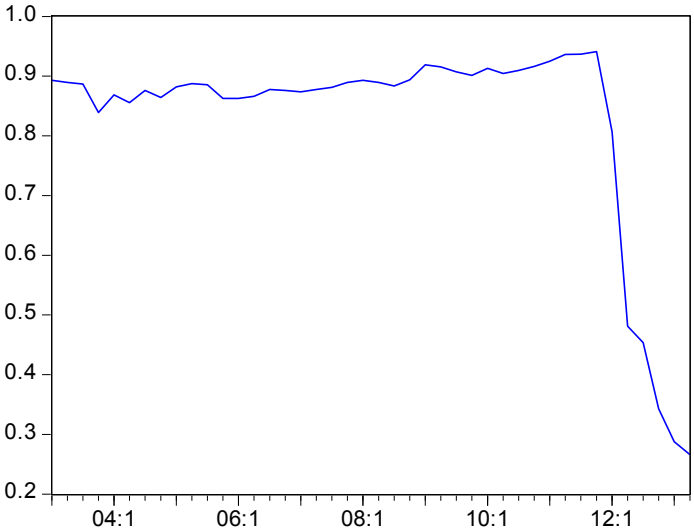
the home bias. As can be seen in chart 2 Ireland experienced a sharp increase in the home bias from 0.05 up to 0.6. This is the largest percentage increase among all euro zone countries.

Chart 2: Home bias for Ireland, securities other than shares, MFI reporting sector



Greece on the other hand as shown in chart 3 maintained a very high home bias up to 2012Q1. The country then experienced a sudden decrease of the home bias. This particular evolution of the home bias stems from the operations of the European Stability Mechanism (ESM) and the ECB's *Securities Market Program.*

Chart 3: Home bias for Greece, securities other than shares, MFI reporting sector



The positions by Greek MFIs vis-à-vis the euro area changed as the ESM exchanged debt securities issued by the Greek government against new debt securities. The new securities' counterparty is the ESM, which is located in Luxembourg.

As can be seen in chart 3 the pre-crisis home bias of Greece has already been extremely high compared to other euro zone countries. It may thus be argued that the exchange of securities has been an important step in order to limit the linkage between Greek banks and the financially distressed government.

3.4 The Empirical Model

In our research we intend to analyze two research questions. First, whether the home bias among MFIs located in the euro zone changed in respect to their domestic vs. other euro zone business in response to the financial crisis. Second, whether the home bias of MFIs has been influenced by the sovereign crisis. An increase in the home bias to a negative shock on sovereign's solvency would support the theory on secondary markets as modelled by Broner, Martin and Ventura (2010).

We proceed in two steps, first we show that the home bias in the pre-crisis years has been decreasing on average across all euro zone countries compared to an increase in the post-crisis years. Second, we show that in addition to this effect sovereigns facing financial distress exhibit on average an even larger increase in the home bias.

Our empirical specification can be formulated as follows:

$$I_{i,t} = \beta_0 * yield_{i.t-1} + \beta_1 * yield_{i,t-1} * fincrisis_{i,t-1} + \gamma * controls_i + \varepsilon_{i,t} \quad (1)$$

In equation (1) the subscript i denotes the reporting country of the MFI sector, and t indicates time, measured in quarters. The dependent variable $I_{i,t}$ is the home bias per country i as introduced in the previous section. The variable $yield_{i,t-1}$ is the bond yield of country i's long-term government bonds[9]. In order to test for a change in the home bias between the pre-

[9] Government bonds with a maturity of 10 years upon issuance

crisis years and crisis years we use the indicator variable $fincrisis_{i,t-1}$. The crisis years are defined as the period after the bankruptcy of the Lehman-Brothers, which is widely considered a key event for the start of the financial crisis. Lastly, we control for country specific effects of the home bias. This ensures that the level of home bias does not influence our results across euro zone countries.

The coefficient of interest β_1 indicates whether or not on average the home bias is different in the periods defined as crisis. It measures the average change in the home bias of a euro zone country for an increase of 100 basis points on the bond yield during the crisis years. The coefficient β_0 analogically measures the effect of a 100 basis points increase of the bond yield on the home bias over the whole observation period. Thus the net effect on home bias during the crisis is represented by $(\beta_0 + \beta_1)$. Our hypothesis is verified under the condition that $\beta_1 \neq 0$.

In the second step, we test for the effect of a country specific crisis. In our case we model the sovereign crisis that affected some of the Eurozone economies. We model this by using the bond yield as quantitative indicator for a sovereign crisis. Brutti and Sauré (2013) used the same procedure in their research on debt repatriation. Our extended model is specified as follows:

$$I_{i,t} = \beta_0 * yield_{i.t-1} + \beta_1 * yield_{i,t-1} * fincrisis_{i,t-1} - +\beta_2 * yield_{i,t-1} * sovcrisis_{i,t-1} + \gamma * controls_i + \varepsilon_{i,t} \quad (2)$$

The variable $sovcrisis_{i,t-1}$ is an indicator variable that is 1 whenever the long-term government bond yield of a country is larger or equal to 500 basis points[10]. We thereby measure the additional effect of the bond yield on the home bias in the case that a country faces financial distress. A positive value for β_2 indicates that the home bias is more pronounced for these countries. This finding would support the theory of debt repatriation

[10] We also test for a threshold of 550 and 600 basis points. The results are in line with our general findings.

through a secondary market.

As we identified in the previous section that Greece has been virtually cut-off from a secondary market we run an extended version of equation (1) and (2) also with a dummy variable for Greece in order to isolate the effect Greece has in our regression.

3.5 Data

In our research we use the datasets *Monetary and Financial Statistics (MFS)* and *Interest Rates Statistics (IRS)* as published by the European Central Bank (ECB). MFS statistics are reported by *Monetary and Financial Institutions (MFIs)* resident in a Eurozone economy and then aggregated per country. For the instrument securities other than shares quarterly data is available and includes the sector breakdown MFIs and non-MFIs. The geographical breakdown for the counterparty includes rest of the world, domestic and the whole Eurozone. These breakdowns are sufficient in order to construct our home bias indicator for securities other than shares issued by non-MFIs within the Eurozone. In our model we have to exclude the role of rest of the world positions as we need a one-to-one mapping between the Eurozone economies. Positions by rest of the world are only available as counterparty, yet we do not have data on positions by all MFIs resident in rest of the world vis-à-vis MFIs in the Eurozone.

Another important limitation is that our data is unconsolidated which means that subsidiaries and branches of foreign banks report separately from the head bank. This may overestimate the cross-border positions as intra-company positions are reported as cross-border activity. Manna (2004) highlights that there is no reliable statistical source for consolidated data that features the same richness, harmonization and timeliness as MFI statistics. Overall he concludes that the resulting bias is limited with respect to his estimates of cross-border activity and the home bias.

Our dataset is an unbalanced panel with 592 observations covering the period 2003Q1

to 2013Q2 and 16 Eurozone countries. We exclude in our regression data on Estonia (EE) as there is no suitable bond yield data available to match the home bias in the periods 2011Q1 to 2013Q2. We do not expect this to alter our results markedly due to Estonia's recent introduction of the Euro and its relatively small banking sector compared to other Eurozone economies.

4 Results

In this section we present our estimation results of our empirical model (1) and (2). The first model analyzes the effect of the financial crisis on the home bias of Eurozone MFIs, while the second model assesses the additional impact of the sovereign crisis.

4.1 Holdings of Securities other than Shares

We use for all our models a maximum likelihood estimation (MLE) with an unbalanced panel and control for country fixed effects. Thus the level effect of the home bias per country is controlled for in our model.

In table 1 the estimation results of model (1) are presented. On average a Eurozone country has a home bias of 63.5. The coefficient for the overall effect of the bond yield $yield_{i.t-1}$ on the home bias is highly significant at -0.035. This means that an increase in the rate by 1% actually decreases the home bias. The effect of the financial crisis $yield_{i,t-1} * fincrisis_{i,t-1}$ on the home bias is also significant at 0.028. In other words, the home bias increased if the bond yield rose by 1% after the financial crisis. The net effect on the home bias $(\beta_0 + \beta_1)$, however, remains negative. This result and the negative coefficient for $yield_{i.t-1}$ stand in contrast to our hypothesis. To our knowledge there is no established theory that would explain an increase of the interest rate causing a declining home bias. At this stage two aspects might be of relevance for the negative effect. First, the evolution of the home bias in Greece is influenced by the extra-ordinary measures of the ESM, rather than representing

normal market behavior. Greece experienced a sharp rise in its bond yield, yet due to the ESM measure the home bias actually decreased significantly. Second, it could be that the negative coefficient is actually a result of prevailing endogeneity. As can be seen in the following paragraph and in our section on robustness checks both aspects matter.

To address the first claim, we re-run model (1) and control for the effect Greece has on our estimation results. Table 2 illustrates the results after controlling for Greece.

The overall effect of the bond yield $yield_{i.t-1}$ is positive, yet insignificant. The effect of the financial crisis is highly significant and positive at 0.03. Compared to the first estimate these results are in line with our findings in the descriptive part on the home bias. There is no influence of the bond yield on the home bias prior to the financial crisis.

In model (2) we expand the analysis to include the effect the sovereign crisis has on the home bias of Eurozone economies. Table 3 illustrates the results without controlling for the effect of Greece. All coefficients are highly significant. The bond yield $yield_{i.t-1}$ over the whole observation period has a negative effect on the home bias by -0.062. This negative effect cannot be explained by the presented theories. However, the financial crisis $yield_{i,t-1} * fincrisis_{i,t-1}$ and sovereign crisis $yield_{i,t-1} * sovcrisis_{i,t-1}$ have a positive effect on the home bias by 0.019 and 0.029 respectively.

When controlling for Greece the sign of the coefficients remain the same, but the magnitude changes. In table 4 the results are depicted for model (2) and a control dummy for Greece. All coefficients are significant and in line with our descriptive statistics. On average the home bias of Eurozone MFIs with regard to holdings of securities other than shares is 0.612. A rise in the bond yield in general decreases the home bias of the MFIs over the whole observation period. This effect is statistically present during the pre-crisis year. The effect of the financial crisis accounts for 0.022. MFIs located in a country with a bond yield >5% on average increase their home bias further by 0.029.

The counterintuitive negative effect β_0 on the home bias is very likely caused by endogeneity through a confounding variable. For instance, the yield and home bias are both affected by the supply and demand for securities. According to the theory on secondary markets an exogenous drop in the foreign demand for a government's securities would induce a relative increase of local holdings of securities. However, simultaneously, the exogenous shock may cause a rise or fall in the yield of the government. The willingness of local investors to absorb the excess supply of these securities determines whether or not the yield is affected. If local investors completely absorb the excess supply the yield remains unchanged, however, if some excess supply remains the yield will rise further albeit. The theory predicts that a rise in the yield increases local demand, which in turn affects the yield. This raises concerns whether the error term $\varepsilon_{i,t}$ is uncorrelated with the yield. To address any existing endogeneity we also estimate an instrument variable (IV) regression in section 3.3. As there are significant differences between the two models, we deduct that the errors $\varepsilon_{i,t}$ correlate, in fact, with β_i .

4.2 Robustness Checks and Statistical Tests

In this section we provide the results of the statistical checks and robustness checks we ran for our regression models. First, we verify that the fixed effects model is preferred to the random effects model. Second, the model is re-run with the log of the bond yield in order to capture marginal effects. Third, in order to overcome the problem of endogeneity in our model we apply an instrument variable (IV) approach. All checks and tests are applied to the extended model in which we control for the effect of Greece.

The Hausman Test is a usual statistical hypothesis test in order to determine whether a fixed effects or random effects model is consistent with the data. The null-hypothesis states that the random effects model is consistent, while the alternative-hypothesis supports the fixed effects model. Table 5 illustrates the results of our test. We receive a p-value of 0.01 and

can thus clearly reject the null-hypothesis. Our fixed effects model is appropriate.

The use of a log on the interest rate enables us to capture marginal effects of the interest rate on the home bias of MFIs. The logged version of model (2) can be defined as follows:

$$I_{i,t} =$$

$$\beta_0 * \log\_yield_{i.t-1} + \beta_1 * \log\_yield_{i,t-1} * fincrisis_{i,t-1} + \beta_2 * \log\_yield_{i,t-1} * sovcrisis_{i,t-1} + \gamma * controls_i + \varepsilon_{i,t}$$

The results of the regression are depicted in table 6. All coefficients are significant and have the same sign as in the non-logged model. The net effect of $(\beta_0 + \beta_1 + \beta_2)$ of the interest rate on the home bias is positive. Thus a country facing a sovereign crisis on average experiences for a 10% increase of the bond yield a rise in the home bias by 0.0039. The magnitude thus is rather small.

In our two models the impact of bond yields on the home bias is measured. A priori it is not clear that the independent variable is uncorrelated with the error terms. In fact, it may happen that non-Euro area demand for euro area bonds drops and thus causes a rise in the bond yields. The magnitude of this rise will depend on the willingness of local investors to absorb the excess supply of government bonds. The willingness to absorb the excess supply also affects the home bias, which measures the relative holdings of domestic to euro area. To control for the endogeneity problem we apply an instrument variable (IV) regression or two-stage-least-square method.

Basically one predicts the bond yield based on a set of instrument variables. This avoids that the variable is correlated with the error terms. In our case we use the level of GDP, GDP growth, government debt, the government's balance, the current account balance (all three as ratio to GDP) and the inflation rate[11] to predict bond yields. Borenszstein and Panizza (2006), as well as, Brutti and Saure (2013) use the same specifications to predict bond yields. Our

[11] Data by Eurostat and the World Bank

first-stage panel regression predicts about 44% of the variation in the bond yields which is somewhat lower than the 60% percent in the model of Brutti and Saure (2013), as well as, Borenszstein and Panizza (2006). In addition, the Wald test confirms that all instruments are relevant in our model. The results of the first-stage regression are presented in table 7.

The second-stage panel regression includes our predicted value for the yield called $yieldhat$. As can be seen in table 8 all coefficients are significant and have the expected sign. Other than in the simple panel regressions all yield coefficients are positive. This means that an increase in the bond yield causes the home bias to rise in the pre-crisis and crisis years, as well as, in the presence of a sovereign crisis. The magnitude of the increase is the highest for countries facing financial distress where we find for $(\beta_0 + \beta_1 + \beta_2)$ an effect of 0.079 for a 100 basis point increase on the yield.

The IV-regression, or two-stage-least-square regression, thus indicates that our model is affected by endogeneity. The coefficient β_0 changes its sign after controlling for the correlation of the error terms. The results of the IV-model are providing even more plausible evidence for the positive effect of the yield on the home bias.

4.3 Theories relating to Home Bias of Banks

Our research reveals when controlling for the effect of Greece and endogeneity that the home bias increases with an increase in the yield of a country. We observe that the magnitude changes during the observation period after the financial crisis and even more so in the case of sovereign distress. Previous literature provides several relevant theories to explain increases in the home bias. In this paper we discuss six possible explanations: (1) Secondary market theory, (2) comparative advantage, (3) information frictions, (4) hedging motives, (5) carry trades and (6) moral suasion.

Secondary Market Theory. Broner, Martin and Ventura (2010) introduce a theoretical framework for the secondary market theory. The key consideration is that a government has

higher incentives to default on foreign debt than domestic debt. This is due to the second round effects a default on domestic investors in contrast to foreign investors would have on the local economy. A default on domestic creditors would weaken the balance sheet of local banks and thus limit their ability to provide credit to the private sector. This in turn would affect economic growth and consequently future tax income. Since foreign investors consider these securities riskier than local investors they will sell them. As the risk is lower for domestic investors they will buy these securities and increase their home bias in search for profit opportunities.

An essential prediction of the model is that the home bias for securities issued by governments is affected, while securities issued by the private sector do not carry the same risk considerations. Our model does not distinguish between privately or publicly issued securities due to limited availability of the data. However, based on the primary result that the overall home bias increased, we can analyze how the split between publicly and privately issued securities behaves in domestic markets. Therefor the following model is introduced:

$$publicdebt\_ratio_{i,t} = \beta_0 * yield_{i.t-1} + \beta_1 * yield_{i,t-1} * fincrisis_{i,t-1} + \beta_2 * yield_{i,t-1} * sovcrisis_{i,t-1} + \gamma * controls_i + \varepsilon_{i,t} \quad (3)$$

The public debt ratio $publicdebt\_ratio_{i,t}$ is simply the share of securities issued by the public sector compared to securities issued by the non-MFI (non-bank) sector. An indicator of 1 would imply that MFIs in country i exclusively hold securities issued by the public sector (not considering holdings within the MFI-sector). We explain the indicator for public debt with the same specifications as for the home bias in model (2) and control for Greece.

Table 8 depicts our findings. The pre-crisis effect of the bond yield on the public-private split is not statistically significant. The financial crisis has a negative impact on the public debt ratio, while the sovereign crisis has a positive effect. In other words, an increase in the bond yield actually decreased the public debt ratio after the financial crisis, while the

sovereign crisis had the opposite effect. The results surrounding the sovereign crisis are in line with the prediction provided by the secondary market theory. However, the effect of the financial crisis is actually indicating a different pattern. Model (2) predicts that the home bias increases after the financial crisis, while the results from model (3) for the same period indicate that the public debt ratio decreased. MFIs thus in relative terms increased the share of securities issued by the domestic private sector in this period. A possible explanation for this pattern may be the role of Financial Vehicle Corporations (FVCs) or information frictions. FVCs have been securitizing loans and enabling MFIs to remove loans from their balance. In turn the MFIs often bought back the securities. This specific channel would need further analysis in order to attain a clear conclusion. Alternatively information asymmetries may have driven the increase in the holdings of securities issued by the domestic private sector during the relevant period. This will be illustrated further in the following paragraphs.

Comparative advantage. On a very similar note, Battistini, Pagano and Simonello (2013) define that a home bias might arise if domestic banks have a comparative advantage. Domestic banks are, for instance, better hedged against the redenomination risk of sovereign debt. For instance, if a Eurozone country re-introduces its national currency, domestic banks have an advantage compared to foreign banks. In fact, the same argument may be applied to the secondary market theory. As the incentive of the government to default on debt held domestically is lower compared to debt held abroad, domestic banks have a comparative advantage to their foreign counterparts. Our findings are hence also in line with the theory of comparative advantage.

Information Frictions. The literature in this field focuses on information asymmetries between foreign and local investors. Gehrig (1993) shows that a portfolio home bias arises if signals of an asset's future performance are more precise for domestic than foreign investors. Moreover, Portes et al. (2001) indicate that information asymmetries concern primarily

private borrowers. This stems from the fact that local and foreign government bonds are considered less information-sensitive.

The coefficient for financial crisis in model (3) is negative which means that on average MFIs were increasing the holdings of domestically issued private sector securities (excluding MFIs themselves) relative to securities issued by the public sector. At the same time the financial crisis indicator from model (2) indicates an increase in the home bias. In the case where MFIs are substituting foreign private sector securities with local private sector securities information frictions are a plausible argument. To this end we can only theorize that this has actually taken place. This is due to the fact that we cannot construct a home bias indicator for securities issued by private debt separately from public debt based on the data at hand.

Hedging Motives. Among hedging motives two main fields of research stand out: hedging of real exchange rate risk and non-tradable income. As our data is exclusively based on Eurozone economies there exists no nominal exchange rate risk. Over the observation period inflation rates have remained relatively stable and homogenous. Thus the effective risk from real exchange rate fluctuation is very limited.

The second motive for hedging concerns non-tradable income risk. The idea is that individuals bias their portfolio towards local assets (relative to foreign) if these correlate negatively with local labor income. By this mean local investors smoothen their overall income. Coeurdacier and Gourinchas (2011) show by use of a standard portfolio model that bonds are mainly used to hedge for real exchange rate risk, while equities are used for non-tradable income risk. Moreover, Coeurdacier and Rey (2010) show that overall the channel for non-tradable income risk has limited empirical support. Taking into account that our analysis focuses on securities rather than equities and the findings of previous research, it is fair to conclude that hedging motives are not the most plausible explanation for the observed

patterns. Further research would be needed in this field to obtain a clearer conclusion.

Carry trades. Acharya and Steffen (2013) analyze the effect of carry trades during the Eurozone crisis. Carry trades take place when a bank is borrowing money (goes short) to go long in high-yield assets such as sovereign debt of crisis countries. The main motive for banks to engage in carry trades are (1) implicit bailout guarantees, (2) regulatory capital arbitrage due to a zero risk-weight on sovereign debt, (3) risk shifting and (4) available liquidity such as European Central Bank (ECB) funding. Risk shifting behavior means that banks who are under-capitalized engage in risky operations in order to escape default by speculating on a positive outcome of a high reward strategy.

Battistini, Pagano and Simonello (2013) claim that many under-capitalized banks are situated in Greece, Ireland, Portugal, Spain and Italy (PIIGS), and thus may drive an increase in the home bias. However, we fail to see empirical evidence that this is actually the case. Acharya and Steffen (2013) find on the contrary that carry trades are most common among large banks and undercapitalized banks in non-PIIGS countries.

While in theory carry trades may be a factor driving the home bias, the empirical evidence of past research does not support the hypothesis that carry trades increase the home bias in countries facing a sovereign crisis. With respect to the effect of the financial crisis dummy carry trades are not a plausible argument. The motives for carry trades imply that banks buy high-yield sovereign debt, which is not applicable for all Eurozone countries.

Moral suasion. Also postulated by Battistini, Pagano and Simonello (2013) high-risk sovereigns may exert "moral suasion" on banks to increase their holdings of domestic sovereign debt. Our results do not contradict this hypothesis, yet it does not provide clear evidence to support it either. The ability of a sovereign to exert moral suasion depends on many factors such as the jurisdiction and political system. Thus a clear analysis would require determining the influence of these on the home bias. Further research may include an

interaction term in addition to the coefficient on sovereign crisis. Based on the results from our model we can neither proof nor contradict the presence of moral suasion.

To sum up we find that the secondary market theory and the theory on comparative advantage are a plausible explanation for the empirical results obtained by our coefficient on sovereign crisis. Moral suasion may also be a factor, but cannot be confirmed based on our model. Information frictions among the presented theories best explain the effect of the financial crisis. Yet, we view this with some caution since the data does not allow us to test it statistically.

5 Discussion

Our research shows that the yield of a sovereign has a positive effect on it's home bias. The financial and sovereign crises amplify this effect. The latter is found consistent with the secondary market theory and adding evidence to the findings of Brutti and Sauré (2013). Information frictions are a plausible argument for the remaining two observation patterns. Yet, there are also three caveats to our findings.

First, we cannot distinguish between primary and secondary market effects. The home bias could also increase in the absence of a secondary market merely through new issuance or roll over of existing debt on the primary market. Brutti and Sauré (2013) argue rightly that if a government can only default on all tranches of debt or not default at all, the distinction is irrelevant as long as the access to the primary market is the same for foreign and domestic investors. Past defaults such as the Greek hair cut show that a default on specific maturity tranches of debt is the exception. To illustrate the interchangeability of primary and secondary markets consider a model with today and tomorrow, a government, domestic and foreign investors. There is a bond maturing today and one tomorrow. The government now wants to roll over the bond maturing today and issues a new one maturing tomorrow. Just in this

moment an exogenous shock occurs raising the default risk. Our home bias would increase either if the new bond is bought on the primary market by domestic investors or else if the existing bond is traded on the secondary market. As long as the government does not default selectively on one or the other bond tranche the implications are the same.

Second, our analysis excludes the role of non-bank investors and non-Eurozone investors due to limited data availability. As we do not capture the entire market for debt securities our conclusions have to be taken with care. The theories on secondary markets, information frictions, hedging motives and comparative advantage are applicable to non-bank and bank investors. Thus to provide a definitive conclusion also the role of non-bank domestic investors and foreign investors would need to align with the predictions of the theories. Brutti and Sauré (2013) show with descriptive statistics that for the PIIGS countries there is a general flight-to-home pattern for domestic investors. This supports, in their view, the theory on secondary markets, as there is no observable bank-specific pattern. A detailed analysis within our model is, however, not possible as data on government finance statistics for debt securities by holder of the security is only available at annual frequency[12].

In contrast to the already mentioned theories, carry trades incentivized by ECB funding, regulatory capital arbitrage and implicit bail-out guarantees, as well as, moral suasion by regulators are a bank-specific domain. In reference to the previous chapter carry trades are found to be a Eurozone wide phenomenon, while linking moral suasion with the home bias of banks is an area for further research.

Third, the default of Greece stands in contrast to the theory on secondary markets as laid out by Broner, Martin and Ventura (2010). Their main finding is that as long as there is a sufficiently well functioning secondary market a sovereign crisis does not occur. It seems plausible to argue that the theory falls short in explaining specific cases such as Greece that

[12] Data is available from the ECB under Government Statistics (GST).

actually has a well functioning secondary market. Chart 3 shows that the home bias increased visibly, yet the default in the form of a haircut has not been averted. This may be explained by considering that secondary markets operate with some sort of uncertainty about future economic developments. In such case secondary markets do not eliminate the possibility of default, only reduce the likeliness. Brutti and Sauré (2013) argue that this is plausible if domestic investors purchase debt at a heavy discounts in order to be compensated for a possible default, which, in their view, has been the case during the sovereign crisis in the Eurozone. In this light the secondary market theory reduces the default risk, but does not eliminate it. It is worth noting that if trading takes place at heavy discounts sovereigns can still experience considerable yield increases and similarly banks can face substantial losses. Greece is a good example thereof. The secondary market theory under uncertainty predicts that the haircut could have been larger in the absence of a well-functioning secondary market.

Overall, our findings reveal an array of further research topics. The theories on information frictions and secondary markets could be tested against the role of non-bank domestic investors and foreign investors. Another aspect is the role of moral suasion on the home bias, as well as, the relevance of Financial Vehicle Corporations (FVCs) for the home bias of Eurozone banks.

All these topics bear relevance for policy decision on a Eurozone and national level for designing a framework of good governance in the banking sector. The role of the bank home bias is dual in the sense that it can mitigate the default risk of sovereigns and similarly concentrate risk at the national level. A well-designed framework should address this duality appropriately. As Eurozone bond markets are well developed the main concern lies with the resulting bank-sovereign interdependence and cases such as Greece where default cannot be averted by trading on secondary markets.

6 Conclusion

This research uncovered three effects of a sovereign's yield on the home bias of the banking sector in the Eurozone. First, a higher yield leads to a higher home bias.

Second, the financial crisis amplified the effect. The most plausible theory explaining this causality is information frictions. A rise in the yield of a sovereign indicates a rising uncertainty about the asset's future performance and the financial crisis in general induced uncertainty in the market. In such cases, domestic investors tend to have more accurate information to assess the actual value of an asset.

Third, the sovereign crisis intensified the causality effect for affected countries. We find that this aligns with the secondary market theory and the theory on the comparative advantage. Foreign investors value the risk of default differently than domestic investors and secondary markets provide the mean for moving the assets to domestic investors who can bear the risk.

The above findings are in particular interesting in the current economic environment in the Eurozone. The home bias in the Eurozone reached it highest point since 2003 causing concerns regarding the bank-sovereign interdependence. Our observations are in line with the trilemma presented by Pisani-Ferry (2012). The trilemma views the bank-sovereign interdependence as a cause of the no-lender-of-last-resort policy and the absence of a fiscal union in the Eurozone. As both alternative policies are unlikely to gain ground in the current political environment, policy makers should focus on managing the risk at national level caused by the bank-sovereign interdependence.

Moving to a banking union is an important step towards a more resilient banking sector in the Eurozone. A single supervisory framework addresses moral suasion, but falls short in addressing the bank-sovereign interdependence. Thus, a single resolution mechanism and common safety net is of equal importance in for the banking union (see Goyal et al. 2013).

7 Appendix

Table 1: Home bias, panel regression, model 1

Dependent Variable: HOMEBIAS
Method: Panel Least Squares
Sample (adjusted): 2003Q2 2013Q2
Total panel (unbalanced) observations: 576

	Coefficient	Std. Error	t-Statistic	Prob.
C	0.634556	0.013766	46.09726	0.0000
YIELD(-1)	-0.034965	0.003905	-8.954826	0.0000
YIELD(-1)*FINCRISIS(-1)	0.027718	0.002577	10.75781	0.0000

Effects Specification

Cross-section fixed (dummy variables)

R-squared	0.786023	Mean dependent var	0.550174
Adjusted R-squared	0.779504	S.D. dependent var	0.250404
S.E. of regression	0.117582	Akaike info criterion	-1.412603
Sum squared resid	7.714701	Schwarz criterion	-1.276475
Log likelihood	424.8296	Hannan-Quinn criter.	-1.359514
F-statistic	120.5738	Durbin-Watson stat	0.127135
Prob(F-statistic)	0.000000		

Table 2: Home bias, panel regression, model 1, controlling for Greece

Dependent Variable: HOMEBIAS
Method: Panel Least Squares
Sample (adjusted): 2003Q2 2013Q2
Total panel (unbalanced) observations: 576

	Coefficient	Std. Error	t-Statistic	Prob.
C	0.492794	0.017051	28.90057	0.0000
YIELD(-1)	0.003579	0.004741	0.754947	0.4506
YIELD(-1)*FINCRISIS(-1)	0.029812	0.002306	12.92868	0.0000
YIELD(-1)*GREECE(-1)	-0.058383	0.004870	-11.98752	0.0000

Effects Specification

Cross-section fixed (dummy variables)

R-squared	0.829906	Mean dependent var	0.550174
Adjusted R-squared	0.824409	S.D. dependent var	0.250404
S.E. of regression	0.104928	Akaike info criterion	-1.638646
Sum squared resid	6.132559	Schwarz criterion	-1.494955
Log likelihood	490.9301	Hannan-Quinn criter.	-1.582608
F-statistic	150.9806	Durbin-Watson stat	0.178594
Prob(F-statistic)	0.000000		

Table 3: Home bias, panel regression, model 2

Dependent Variable: HOMEBIAS
Method: Panel Least Squares
Sample (adjusted): 2003Q2 2013Q2
Total panel (unbalanced) observations: 576

	Coefficient	Std. Error	t-Statistic	Prob.
C	0.744722	0.020835	35.74355	0.0000
YIELD(-1)	-0.061570	0.005403	-11.39530	0.0000
YIELD(-1)*FINCRISIS(-1)	0.018568	0.002814	6.597287	0.0000
YIELD(-1)*SOVCRISIS(-1)	0.029134	0.004256	6.845373	0.0000

Effects Specification

Cross-section fixed (dummy variables)

R-squared	0.802627	Mean dependent var	0.550174
Adjusted R-squared	0.796249	S.D. dependent var	0.250404
S.E. of regression	0.113029	Akaike info criterion	-1.489906
Sum squared resid	7.116044	Schwarz criterion	-1.346215
Log likelihood	448.0930	Hannan-Quinn criter.	-1.433869
F-statistic	125.8374	Durbin-Watson stat	0.169729
Prob(F-statistic)	0.000000		

Table 4: Home bias, panel regression, model 2, control for Greece

Dependent Variable: HOMEBIAS
Method: Panel Least Squares
Sample (adjusted): 2003Q2 2013Q2
Total panel (unbalanced) observations: 576

	Coefficient	Std. Error	t-Statistic	Prob.
C	0.612226	0.022227	27.54384	0.0000
YIELD(-1)	-0.030653	0.005712	-5.366361	0.0000
YIELD(-1)*FINCRISIS(-1)	0.022212	0.002506	8.863848	0.0000
YIELD(-1)*SOVCRISIS(-1)	0.029445	0.003699	7.960571	0.0000
YIELD(-1)*GREECE(-1)	-0.040876	0.003578	-11.42489	0.0000

Effects Specification

Cross-section fixed (dummy variables)

R-squared	0.841645	Mean dependent var	0.550174
Adjusted R-squared	0.836233	S.D. dependent var	0.250404
S.E. of regression	0.101334	Akaike info criterion	-1.706688
Sum squared resid	5.709312	Schwarz criterion	-1.555434
Log likelihood	511.5260	Hannan-Quinn criter.	-1.647700

F-statistic	155.5314	Durbin-Watson stat	0.220730
Prob(F-statistic)	0.000000		

Table 5: Hausman Test, fixed or random effect model

Correlated Random Effects - Hausman Test
Equation: Untitled
Test cross-section random effects

Test Summary	Chi-Sq. Statistic	Chi-Sq. d.f.	Prob.
Cross-section random	13.056715	4	0.0110

Cross-section random effects test comparisons:

Variable	Fixed	Random	Var(Diff.)	Prob.
YIELD(-1)	-0.019970	-0.020699	0.000000	0.0946
YIELD(-1)*FINCRISIS(-1)	0.022474	0.022380	0.000000	0.4841
YIELD(-1)*SOVCRISI(-1)	0.022907	0.022902	0.000000	0.9786
YIELD(-1)*GREECE	-0.054399	-0.052823	0.000000	0.0121

Cross-section random effects test equation:
Dependent Variable: HB
Method: Panel Least Squares
Sample (adjusted): 2003Q2 2013Q2
Total panel (unbalanced) observations: 576

	Coefficient	Std. Error	t-Statistic	Prob.
C	0.589089	0.023223	25.36621	0.0000
YIELD(-1)	-0.019970	0.006087	-3.280672	0.0011
YIELD(-1)*FINCRISIS(-1)	0.022474	0.002560	8.780336	0.0000
YIELD(-1)*SOVCRISIS(-1)	0.022907	0.003874	5.912212	0.0000
YIELD(-1)*GREECE	-0.054399	0.004776	-11.38974	0.0000

Effects Specification

Cross-section fixed (dummy variables)

R-squared	0.839966	Mean dependent var	0.550174
Adjusted R-squared	0.834498	S.D. dependent var	0.250404
S.E. of regression	0.101869	Akaike info criterion	-1.696144
Sum squared resid	5.769826	Schwarz criterion	-1.544891
Log likelihood	508.4896	Hannan-Quinn criter.	-1.637157
F-statistic	153.5932	Durbin-Watson stat	0.207179
Prob(F-statistic)	0.000000		

Table 6: Log of the bond yield, panel regression

Dependent Variable: HB
Method: Panel Least Squares
Sample (adjusted): 2003Q2 2013Q2
Total panel (unbalanced) observations: 576

	Coefficient	Std. Error	t-Statistic	Prob.
C	0.619101	0.028230	21.93032	0.0000
LOG_YIELD(-1)	-0.062237	0.021323	-2.918771	0.0037
LOG_YIELD(-1)*FINCRISIS(-1)	0.067535	0.007507	8.996790	0.0000
LOG_YIELD(-1)*SOVCRISIS(-1)	0.088710	0.011095	7.995844	0.0000
LOG_YIELD(-1)*GREECE(-1)	-0.409635	0.033057	-12.39161	0.0000

Effects Specification

Cross-section fixed (dummy variables)

R-squared	0.840002	Mean dependent var	0.550174
Adjusted R-squared	0.834534	S.D. dependent var	0.250404
S.E. of regression	0.101858	Akaike info criterion	-1.696364
Sum squared resid	5.768560	Schwarz criterion	-1.545110
Log likelihood	508.5527	Hannan-Quinn criter.	-1.637376
F-statistic	153.6334	Durbin-Watson stat	0.220952
Prob(F-statistic)	0.000000		

Table 7: Instrument Variable (IV) regression, two-stage-least-square regression

First Stage: regression on yield

Dependent Variable: YIELD
Method: Panel Least Squares
Sample: 2003Q1 2013Q2
Total panel (unbalanced) observations: 535

	Coefficient	Std. Error	t-Statistic	Prob.
C	3.405106	0.481256	7.075457	0.0000
GDP	-1.23E-05	2.68E-06	-4.576994	0.0000
GDPG	-0.156728	0.066452	-2.358503	0.0187
GOVB	0.018103	0.010981	1.648522	0.0999
GOVD	0.044268	0.004174	10.60450	0.0000
INF	0.071721	0.049509	1.448643	0.1480
CA	0.000663	0.017423	0.038053	0.9697

Effects Specification

Cross-section fixed (dummy variables)

R-squared	0.442074	Mean dependent var	4.120062
Adjusted R-squared	0.421491	S.D. dependent var	1.428135
S.E. of regression	1.086236	Akaike info criterion	3.039981
Sum squared resid	607.6532	Schwarz criterion	3.200066

Log likelihood	-793.1949	Hannan-Quinn criter.	3.102615
F-statistic	21.47696	Durbin-Watson stat	0.203191
Prob(F-statistic)	0.000000		

Second Stage: yieldhat = yield – resid (of first stage)

Dependent Variable: HB
Method: Panel Least Squares
Sample (adjusted): 2003Q2 2013Q2
Total panel (unbalanced) observations: 524

	Coefficient	Std. Error	t-Statistic	Prob.
C	0.349575	0.036078	9.689449	0.0000
YIELDHAT(-1)	0.046654	0.009250	5.043632	0.0000
YIELDHAT(-1)*FINCRISIS(-1)	0.025455	0.002195	11.59418	0.0000
YIELDHAT(-1)*SOVCRISI(-1)	0.008374	0.003264	2.565434	0.0106
IRATEHAT(-1)*GREECE	-0.140825	0.023994	-5.869260	0.0000

Effects Specification

Cross-section fixed (dummy variables)

R-squared	0.890242	Mean dependent var	0.552925
Adjusted R-squared	0.886554	S.D. dependent var	0.254906
S.E. of regression	0.085857	Akaike info criterion	-2.038529
Sum squared resid	3.729908	Schwarz criterion	-1.892142
Log likelihood	552.0945	Hannan-Quinn criter.	-1.981202
F-statistic	241.4193	Durbin-Watson stat	0.150855
Prob(F-statistic)	0.000000		

Wald Test for first stage regression:

Test Statistic	Value	df	Probability
F-statistic	26.36959	(5, 515)	0.0000
Chi-square	131.8480	5	0.0000

Null Hypothesis Summary:

Normalized Restriction (= 0)	Value	Std. Err.
C(2)	-1.23E-05	2.68E-06
C(3)	-0.156728	0.066452
C(4)	0.018103	0.010981
C(5)	0.044268	0.004174
C(6)	0.071721	0.049509

Restrictions are linear in coefficients.

The null hypothesis that all coefficients are irrelevant can be rejected.

Table 8: Panel regression, ratio of securities issued by domestic public

Dependent Variable: PD_RATIO
Method: Panel Least Squares
Sample (adjusted): 2003Q2 2013Q2
Total panel (unbalanced) observations: 576

	Coefficient	Std. Error	t-Statistic	Prob.
C	0.649015	0.027004	24.03389	0.0000
YIELD(-1)	-0.007219	0.007078	-1.019838	0.3082
YIELD(-1)*FINCRISIS(-1)	-0.031954	0.002976	-10.73614	0.0000
YIELD(-1)*SOVCRISIS(-1)	0.022375	0.004505	4.966410	0.0000
YIELD(-1)*GREECE(-1)	0.034204	0.005554	6.158899	0.0000

Effects Specification

Cross-section fixed (dummy variables)

R-squared	0.845961	Mean dependent var	0.579414
Adjusted R-squared	0.840697	S.D. dependent var	0.296782
S.E. of regression	0.118454	Akaike info criterion	-1.394481
Sum squared resid	7.801413	Schwarz criterion	-1.243228
Log likelihood	421.6106	Hannan-Quinn criter.	-1.335494
F-statistic	160.7090	Durbin-Watson stat	0.121954
Prob(F-statistic)	0.000000		

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9 Supplement

9.1 Zusammenfassung

Ziel dieser Magisterarbeit ist den Zusammenhang zwischen dem *Home Bias* von Euroraum Banken für Anleihen ihres eigenen Landes und des Marktzinses dieses Landes darzulegen. Es wird gezeigt, dass mit steigendem Zinssatz heimische Banken einen steigenden *Home Bias* für heimische Anleihen entwickeln. Das präsentierte Model analysiert diesen Effekt im Bezug auf die Finanz- und Staatsschuldenkrise im Euroraum. Beide Krisen verstärken den kausalen Zusammenhang. Daraus folgt, dass Banken in Krisenländer der Eurozone die stärkste Präferenzänderung durchlaufen, wobei der durch die Finanzkrise induzierte Effekt in der ganzen Eurozone beobachtbar ist. Generell wird gezeigt, dass der *Home Bias* von Banken für heimische Anleihen in den letzten Jahren seit 2003 einen neuen Höchststand erreicht.

Basierend auf existierender Literatur lässt sich das beschriebene Phänomen am Besten durch die Theorie zu Sekundärmärkten von Broner, Martin, Ventura (2010) im Bezug auf die Staatsschuldenkrise und durch Informationsasymmetrien im Bezug auf die Finanzkrise erklären. Letzteres ist bereits durch Gehrig (1993) beschrieben worden und wird durch ein breites Spektrum an Literatur untermauert. Relevanter für diese Arbeit ist, dass die Theorie zu Sekundärmärkten von Broner, Martin, Ventura (2010) durch die empirischen Ergebnisse bestätigt wird. Die Theorie besagt, dass Staaten einen stärkeren Anreiz Schulden an ausländischen Investoren nicht zu bedienen im Vergleich zu Schulden an heimische Investoren. Da Investoren dies wissen ergibt sich eine Verschiebung der Schuldentitel vom Auslands ins Inland unter Einhaltung der Profitmaximierung. Daraus folgt eine interessante Dualität. Einerseits federt eine steigende Präferenz der Banken für heimische Anleihen die durch ausländische Investoren verursachte Zinssteigerung ab, andererseits erhöht dies die Interdependenz zwischen Bonität eines Landes und des ansässigen Bankensektors.

Die Aussage der Sekundärmarkttheorie und der zu beobachtende Ansteig der Präferenz für den Heimmarkt ergeben besondere Anforderungen an Regulatoren. Battistini, Pagano und Simonello (2013) beschreiben, dass Regierungen Einfluss nehmen könnten auf lokale Regulatoren auf Grund der steigenden Abhängigkeit von Ländern zu ihren eigenen Banken. Weiters beschreiben Goyal et al. (2013) die Notwendigkeit eines Sicherheitsnetzes und geregeltem Konkursverfahren in der Eurozone. Beide Aspekte sind gemäß der Ergebnisse dieser Arbeit ein notwendiger Schritt hin zu einer stabileren und krisenresistenteren Eurozone.

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