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Cross-border credit derivatives linkages

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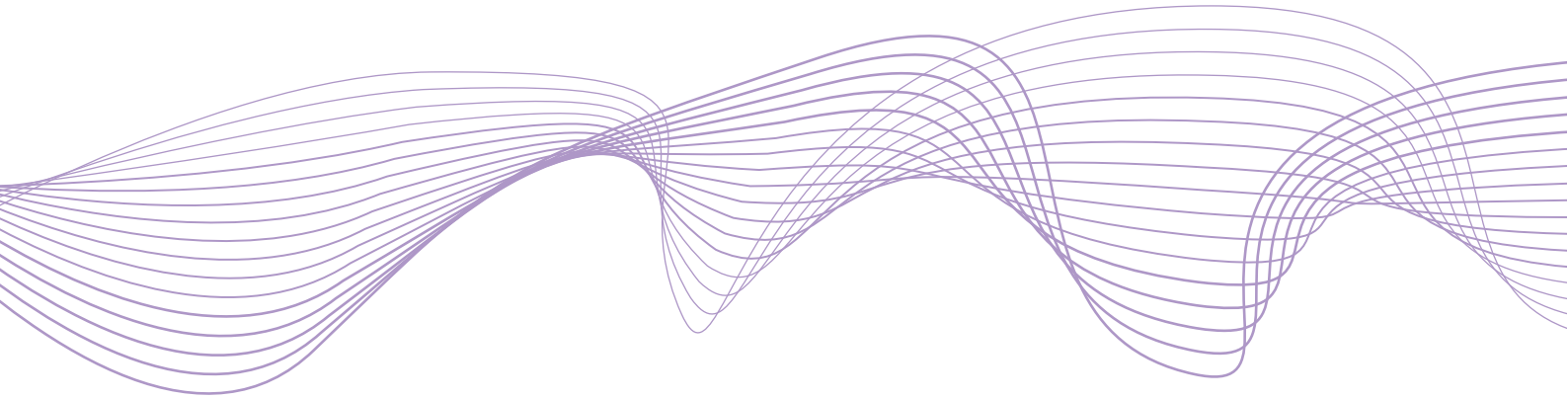

ESRB
European Systemic Risk Board
European System of Financial Supervision

Abstract

This paper is a first attempt to include credit derivatives in international macro-financial analysis. We document that gross credit derivatives holdings map to bilateral portfolio investment linkages. On a net basis, our results suggest an asymmetry between sectors and between net buyers and net sellers of CDSs. When a banking system is a net buyer of protection, the protection purchased is proportional to the debt securities held. Conversely, when a banking system is a net seller, the protection sold is proportional to the securities held. For investment funds, we find no aggregate relation between net CDSs and the debt securities held.

JEL codes: F34, F21

Keywords: Cross-border positions, Risk transfer, CDS, EMIR data

1. Introduction

Over the past three decades the prominence of credit derivatives markets has grown considerably. The role that credit default swaps (CDSs) played in the global financial crisis and the lack of information on CDS exposures prompted a number of regulatory actions aimed at increasing transparency. In Europe, the European Market Infrastructure Regulation mandates the reporting of all derivatives transactions and positions, which led to the creation of a large granular dataset, the so-called EMIR dataset. This rich source of information has been analysed mainly to uncover the structure of derivatives markets, with particular emphasis on interconnectedness and concentration. The topological analysis has greatly improved our understanding of possible contagion paths (D'Errico et al. 2018, Kenny et al. 2016, Abad et al. 2016).

However, an analysis of the role of financial derivatives in cross-border financial linkages is lacking. The international macro-finance literature has shown that monitoring cross-border risks at an aggregated country level carries important information for systemic risk analysis. In particular, the literature has highlighted that (i) there are interconnections between capital flow boom-bust cycles and macro-financial cycles; (ii) the variability of capital flows relates to the level of risk and risk tolerance among global investors; and (iii) the level and composition of external assets and liabilities determines the extent of retrenchment of foreign funding during a crisis.[1]

The motivation for this paper stems from the observation that financial derivatives modify the risk profile of the counterparts without introducing a credit relationship. On aggregate, this introduces a wedge between the external risk profile as it appears from the analysis of international assets and liabilities and the risk profile of the overall external dimension. Seen through the lenses of the findings above, this means that understanding cross-border derivatives holdings is essential to understanding the international transmission of shocks via capital flows.

[1] More details are provided in the following section.

Against this background, we study cross-border risk transfer via credit derivatives holdings in the EU, taking advantage of the virtually complete EU coverage of the EMIR dataset.[2] We start by providing stylised facts on the holding countries and sectors, and on the countries of residence of the underlying reference entities. We then document the relationship between cross-border holdings of credit derivatives and cross-border investment linkages in the EU. The results indicate that gross credit derivatives linkages map to the financial linkages resulting from international investment flows. That is, larger amounts of credit derivatives are bought and sold on residents of financial partner countries.

Moreover, we look at net positions, differentiating between net buyers and net sellers of protection. We show that net buyers purchase more net protection on countries to which they have larger portfolio debt exposure, thereby reducing credit risk. Conversely, net sellers sell larger amounts of protection on countries where they have larger portfolio debt holdings, thereby increasing their exposure.

The paper is structured as follows. The next section collocates this work within the previous literature. The third section introduces the dataset and discusses stylised facts. The fourth section reports the empirical analysis. The last section concludes.

2. Previous literature

The role of external finance in determining domestic macroeconomic outcomes has been widely documented. Capital flows are volatile and pro-cyclical. During upturns, increased inflows from foreign investors are associated with credit and output growth; in downturns, reversals aggravate the deterioration of financing conditions and the compression of domestic spending (see, for example, Bluedorn et al. 2013, Lane & McQuade 2014, Lane & Milesi-Ferretti 2011).

The empirical evidence on the sources of capital flows volatility is consistent with the idea that shocks hit domestic and foreign investors asymmetrically (Broner et al. 2013).

[2]Throughout the paper, we use the terms credit derivatives and CDSs interchangeably.

The different behaviour may be explained, for example, if investors consider foreign assets as riskier than domestic assets. Milesi-Ferretti & Tille (2011) argue that an important underlying force behind capital flow reversals during the crisis has been a risk shock, with both higher risk and lower risk tolerance, leading to an increase in portfolio home bias, with foreign investors reducing the share of foreign assets in their portfolios. Since most countries are small, the repatriation of their foreign assets is insufficient to compensate for capital flight from the side of foreign investors.[3] Thus, foreign investors risk-bearing capacity, and its saturation, are determining factors for domestic financial conditions.

The interplay between risk and capital flows is confirmed by the empirical evidence showing that the characteristics of investment flows determine their volatility. Depending on the type of instrument used and the borrowing sector, capital flows have varying persistence and correlation with the cycle. From the point of view of the financial instrument, Forbes & Warnock (2014) find that 80% of extreme capital inflow events, defined as surges or retrenchments of gross foreign investment, are debt-led, whereas equity instruments, whose structure provide more risk sharing, are more stable. From the point of view of the borrowing sector, Avdjiev et al. (2017) find that private debt inflows are positively correlated with risk appetite, while inflows in government securities, which are considered safer assets, are negatively correlated with risk appetite.

At the same time, the reactivity of capital flows to risk shocks depends on the investor base. Global banks and global investment funds play a crucial role in the dynamics of capital flows, acting as 'pipes' between global financing conditions and receiving countries' domestic financial markets (Carney 2019). During the global financial crisis, bank flows to the affected advanced economies retrenched significantly more than other flows (Milesi-Ferretti & Tille 2011). For emerging markets, recent evidence shows that investment funds play an important role. Within securities flows in the period 2001-2015, a greater exposure to global mutual funds led to a significantly higher sensitivity of equity and bond

[3]The mechanics of this idea are explored theoretically in Caballero & Simsek (2016) and Caballero & Simsek (2018).

markets to global financing conditions (Cerutti et al. 2015).

These findings motivate our interest in the relation between capital flows and derivatives. Intuitively, if derivatives hedge the relevant risk, capital flows may be less volatile. To our knowledge, there is no research on the impact of CDSs on capital flow sensitivities. While not addressing this question directly, we provide first facts on bilateral credit derivatives holdings. We document the country and sector of both the holders and the underlying reference entities. Furthermore, we document a correlation between credit derivatives holdings and bilateral portfolio investment claims.

Existing studies document the characteristics of financial derivatives markets, with a focus on interconnectedness and other properties of the networks (Kenny et al. 2016, Fiedor et al. 2017, Abad et al. 2016). A study closely related to our analysis is Peltonen et al. (2014), which finds that the CDS network shows topological similarities with the interbank network. Furthermore, studying the determinants of CDS market structure, the findings of Peltonen et al. (2014) are consistent with the use of the CDSs to hedge macro risk.

Another paper which relates to our study is D'Errico et al. (2018), which delineates differences in the use of CDSs between sectors. In their sample covering the two years 2011 and 2014, they find that hedge funds are the largest protection buyers, and banks are the largest protection sellers. The relative difference is consistent with our findings, which are based on a more recent sample (2018).

Finally, this study connects to the literature on bilateral investment flows. Papers analysing determinants of bilateral portfolio flows include Portes & Rey (2005), Lane & Milesi-Ferretti (2008), and, at a holding sector level, Galstyan et al. (2016). A more comprehensive analysis, encompassing all types of flows, is provided in Milesi-Ferretti et al. (2010). The determinants of bilateral portfolio dynamics during the global financial crisis are documented in Galstyan & Lane (2013).

3. Bilateral data on credit derivatives

We construct a dataset on cross-border credit derivatives holdings of EU countries and Norway, by aggregating contract-level data from the EMIR dataset.[4] Country holdings are broken down by the country of residence of the underlying reference entity, which we refer to as the underlying country. Our focus on cross-border derivatives means that we exclude contracts where the underlying reference entity and the holding entity are residents of the same country. Defined in this manner, the bilateral credit derivatives position affects the credit risk profile arising from external assets and liabilities. In addition to aggregate country holdings, we analyse holdings by banks; investment funds; and insurance corporations and pension funds.[5] On the underlying reference entity side, we analyse breakdown by sovereign and corporate sectors, in addition to the total underlying market.

Due to the confidential nature of the data source, when showing stylised facts we aggregate the country positions in five country groups based on economic and financial similarities. The countries in the financial centres group are Belgium, Ireland, Luxembourg, Netherlands, and UK. The euro core countries are Austria, Finland, France and Germany. The crisis countries are Greece, Italy, Portugal and Spain. The non-euro members are the countries not part of EMU excluding UK (Bulgaria, Croatia, Czech Republic, Denmark, Hungary, Poland, Romania, Sweden and Norway). The new euro members are Cyprus, Estonia, Latvia, Lithuania, Malta, Slovakia and Slovenia. When this level of aggregation is not sufficient to guarantee confidentiality, we do not show the data. Nevertheless, all country-level and sector-level observations are included in the subsequent regression analysis.

To analyse credit risk transfer, we focus on notional amounts. This choice departs

[4]For brevity, in the remainder of this paper we use the term 'EU countries' but should be understood as EU members plus Norway.

[5]The sectoral allocation is based on self-reported information, which is provided on a trade-by-trade basis; when a given entity reports different sectors for different trades, we choose the most frequently reported sector. Work done internally at the ECB suggests that the self-reported sector is not always correct. Further work aims to adjust this possible source of noise.

from the accounting framework used for derivatives in the Balance of Payments and International Investment Position statistics since in the latter, derivatives are recorded at replacement value. This measures the materialised (even though revertible) gains and losses from the derivatives positions, which give rise to cash flows (BoP) or credit/debt positions (IIP), depending on the settlement frequency (i.e. variation margin payments). In contrast, the notional amount of a CDS measures the potential future gains or losses which may arise from changes in default probability or risk premia; i.e., it measures risk transfer. This is analogous to the concept of risk transfer in the BIS statistics, with the difference that the focus here is on capital flows, rather than the ultimate risk in bank balance sheets; therefore, our analysis is based on the residency principle.

We complement the credit derivatives data with bilateral banking positions from both the BIS locational banking statistics and the coordinated portfolio investment survey of the IMF; and debt securities holdings by sector from the securities holdings statistics of the ECB.

3.1. Comparison with other data sources

The European Market Infrastructure Regulation obliges any European entity trading derivatives to report these trades to dedicated trade repositories. As such, the coverage of this dataset is virtually complete; however, due to reporting issues, a data cleaning procedure is performed, which means that full coverage may not be warranted (see Abad et al. 2016). For this reason, in this section we provide a comparison with estimates from other data sources which are publicly available.

In our dataset, at end-September 2018 total outstanding notional amount of *single-name* CDS contracts with both the underlying reference entity and the reporting entity *resident in the EU* is €1,106 billion on the buy side.[6] From the BIS OTC derivatives

[6] This includes all counterparts, and double-counts centrally cleared trades to facilitate comparison with BIS statistics. BIS numbers double-count centrally cleared inter-dealer trades (but single-counts cleared trades between a dealer and a non-dealer) and excludes contracts where the counterparts are residents of the same country. With this caveat in mind, these figures can be compared in broad terms.

statistics, total CDS contracts – both index and single name, with underlying entity from anywhere in the world – purchased by European residents and with foreign counterpart are €3,164 billion at end-2018. Assuming the proportion of single name contracts is the same among European counterparts as in the global market (49% from BIS statistics), single-name CDSs purchased by Europeans can be estimated at €1,536 billion. This includes contracts with underlying reference entities from both the EU and the rest of the world.

The proportion of contracts with EU underlying in the global market is 52%.[7] Assuming the proportion is the same among European counterparts, single-name CDSs purchased by Europeans and with European underlying are €802 billion. We consider this a lower bound, since the CDS market with European underlying is likely to be more popular amongst European counterparts than amongst other counterparts. On the other extreme, if all EU-traded single name market had an EU entity as underlying reference, the figure would be €1,536 billion —an upper bound estimate. The actual figure is likely to be considerably larger than €802 billion and considerably lower than €1,536 billion, so we are confident that our figure of €1,106 billion is broadly correct and close to full coverage.

3.2. Stylised facts

Single-counting centrally clerared trades, outstanding notional amounts of credit derivatives purchased by EU entities and with EU underlying is €896 billion (Table 1). The countries with the largest underlying markets are United Kingdom, Italy, France and Netherlands. With the exception of UK, this is largely a cross-border market, since contracts where the underlying reference entity and the holding entity are in the same country are very small (Table 2).

The aggregated numbers at the bottom of Table 1 imply that €33 billion EU credit risk is transferred out of the EU to counterparts resident in the rest of the world. While this number is small, the aggregation masks country heterogeneity. European residents

[7] International Capital Markets Association (2018)

are net buyers of protection on Germany, France and UK, and net sellers of protection on Italy, Belgium and Sweden.

In the rest of the analysis, we focus on cross-border holdings; namely, we eliminate trades where the reporting counterpart and the underlying reference entity reside in the same country. Overall, intra-EU cross-border credit derivatives holdings are €714 billion on the buy side, €688 billion on the sell side.[8] Figure 1 shows that bar temporary reporting issues, cross-border credit derivatives have been stable at around €700 billion in the period from March 2018 to January 2019.

Figure 2 aggregates intra-EU cross border credit derivatives by sector and country group of the underlying reference entity. Outstanding amounts of credit derivatives written on crisis countries are €250 billion, while contracts on euro core or financial centres are each €200 billion. While contracts on crisis countries tend to be written on the government sector, corporations are more popular in the financial centres group, and euro core countries sit somewhere in between. On a net basis, the aggregate position on crisis countries is balanced, meaning that there is little crisis countries-risk transfer out of the EU. In contrast, EU residents are net buyers of protection on euro core sovereigns and financial centres corporations.

Next, we aggregate by holding country group in Figure 3. Financial centres are the largest holders with approximately €500 billion outstanding notional, mostly held by non-banks. Euro core countries are also significant holders with approximately €200 billion. Holdings by crisis countries and other country groups are negligible. On net, euro core countries are net sellers of protection, whereas financial centres are net buyers of protection on EU entities.

In Figure 4 the aggregation is by holding sector and underlying country group. Investment funds are the largest holders, followed by banks. For both banks and funds, holdings are fairly split between crisis countries, euro core countries and financial centres.

[8]The sector of the underlying reference entity is unknown for contracts with notional of €11 billion on the buy side and €12 billion on the sell side. We exclude these contracts from our final dataset.

However, on a net basis the geographical activity of the two sectors differ. Investment funds are net buyers of protection on all country groups, whereas banks are net sellers of crisis countries CDSs, and net buyers of CDSs on the other country groups. Insurances and pension funds are small players on a gross basis, but the order of magnitude of the net position is similar to that of banks. This suggests that insurances are relatively more directional players than banks and funds.

Finally, Figure 5 provides a breakdown by both holding country group and underlying country group. For both euro core countries and financial centres, holdings are distributed homogeneously between the three largest country groups. Euro core countries are net sellers of protection on all country groups; financial centres are net buyers on all country groups.

Concentration ratios and number of participants in each market, reported in Table 3, imply that compared to financial centres, holdings by euro core countries are more concentrated in the two largest holding institutions, and the number of holding entities is lower.

Overall, the scale of cross-border credit derivatives holdings is significantly smaller than cross-border asset positions. The notional amount of banks aggregated cross-border CDS positions (gross buy side) is only 2.6% of total gross banking claims. At the bilateral level, the distribution has a median of 1.6%, the 75th percentile is 4.8%, and the 90th percentile is 11.8%; in five bilateral relations in our sample, CDSs outstanding are at least one third of banking claims; the maximum proportion is 80%. While there is variation at the bilateral level, these positions do not give rise to a very significant off-setting of the risks in the underlying investment positions unless there are actual defaults. As a hedge against day-to-day valuation changes in the underlying bonds positions, the position in the CDS would have to be multiples of the underlying bond position. But for the interesting times when default concerns dry out international financial markets, these CDS holdings have the potential to somewhat reduce the credit risk concerns fuelling the panic.

4. Empirical analysis

The stylised facts suggest that holdings of CDSs relate to macro-financial factors of both the holding country and the underlying country. We test this empirically both on an aggregate and a bilateral level. Firstly, we analyse the determinants of cross-border holdings, looking at both the determinants of the holdings and the determinants of the cross-border underlying market size. Secondly, we investigate whether bilateral CDS holdings map to bilateral links in assets and liabilities.

To study aggregate determinants, we estimate the following equation:

$$\log outstanding\ notional_{i,j,s} = \alpha_s + \beta_s * x_i + \gamma_s * x_j \tag{1}$$

where the dependent variable is the gross buy side; x denotes the macro-financial characteristics of either the holding or the underlying country; i indicates the holding country, j the underlying country, and s the holding sector (banks or investment funds). We first estimate the equation including CDSs written on all sectors; we then estimate it for CDSs on the government sector, indicating when the results are statistically different from the corporate sector. In the next section, we report results for the buy side only; these are not statistically different from the coefficients estimated using the sell side.

The aggregate determinants were selected with a top-down approach. We first estimate an equation including factors capturing countries fundamentals. These are: size of the economy; economic development; financial development; financial openness; size of debt securities market; and size of government debt securities market. We removed the variables that were insignificant and the removal of which did not impact the other coefficients.[9]

For the bilateral analysis, we match credit derivatives holdings from the EMIR dataset with three databases of international financial exposures: the BIS locational banking statistics; the IMF coordinated portfolio investment survey, and the ECB securities hold-

[9]The only irrelevant variable was the size of debt securities market. This is highly correlated with our financial openness measure.

ings statistics. The first two datasets have a wider geographical coverage than the third, and are recorded at market value (consistent with balance of payments statistics). We use these two sources to assess the relation with different types of financial linkages, and to compare the holdings of EU countries to those of euro area countries. The third dataset has a richer sector breakdown and the data are recorded at nominal values (which allows a better comparison with the amount of protection purchased), although it covers only euro area countries. We use this third data source to compare banks and investment funds, and their holdings in the government sector and corporations.

We estimate the following equation:

$$\log outstanding\ notional_{i,j,s} = \alpha_s + \beta_s * \log claims_{i,j,s} + \gamma_s * controls_{i,j} \tag{2}$$

where the dependent variable is the gross buy side; and the controls, when included, are alternatively holding country fixed effects, underlying country fixed effects, and the macro-financial characteristics of both holding country and underlying country. We estimate the equation separately for banks holdings and investment funds holdings, first including holdings in all sectors and then splitting between government and corporations.

Without the controls, a positive β indicates that on average, credit derivatives map to bilateral investment linkages. With the controls, β represents the extent to which bilateral CDS holdings are associated with bilateral investment links over and above the propensity to be a holding country and the propensity to be an underlying country.

Finally, we look at net protection purchased, estimating the following equation:

$$outstanding\ net\ notional_{i,j,s} = \alpha_s + \beta_s * claims_{i,j,s} + \gamma_s * controls_{i,j} \tag{3}$$

where the dependent variable is protection purchased minus protection sold on entities belonging to the same country, and *claims* is debt securitites from the securities holdings statistics.

We estimate the equations by least squares with standard errors clustered at the

holding country level.

4.1. Results

We start by studying the aggregate determinants. Estimates of equation 1 are reported in Table 4. The results confirm that cross-border credit derivatives are associated with the macro-financial characteristics of both the holding country and the underlying country. Specifically, holdings of large economies, financially open countries and more developed economies are larger. On the other side, the coefficients relating to the underlying country suggest that holdings are larger when the underlying reference entities reside in large countries, financially open countries, more developed economies and countries with deeper financial markets. Not surprisingly, factors associated with large credit markets are also associated with the size of credit derivatives markets.

This result is consistent across holding sectors, with bank holdings better captured than funds holdings (compare the R-squared in the second column to the third).[10] The higher coefficient on holding country GDP for funds may be explained by the location of investment funds, often domiciled in countries with high income per capita, such as Luxembourg. Possibly due to the intrinsecally international nature of their investment activity, cross-border holdings of investment funds are larger vis-à-vis financially integrated countries, while independent of the international vocation of the country of domicile. On the other hand, traditionally more domestic oriented banks tend to have larger cross-border derivatives holdings when based in financially open economies.

In the last three columns, the same equation is estimated restricting the underlying reference entity to the government sector. Bold coefficients indicate when the coefficient is statistically different to the corresponding coefficient estimated using credit derivatives on corporations as the dependent variable. The results are similar to the results obtained for all underlying entities, with two notable though not surprising differences. First, mar-

[10]The number of observations is insufficient to estimate this equation meaningfully for insurances and pension funds.

kets with government underlying are larger in countries with relatively large government securities outstanding. Second, markets with corporations underlying are larger in large economies, where there tends to be a larger corporate sector.

All the coefficients in Table 4 are not statistically different from the coefficients obtained using the sell side as the dependent variable. As buy and sell sides are very correlated at an aggregate level, the determinants of one side explain also the other side.

Having established aggregate determinants, we turn to the role of bilateral linkages. Tables 5 and 6 report estimates of equation 2, linking banks CDS holdings to bilateral banking claims. In these tables, we use the locational banking statistics and the coordinated portfolio investment survey to compare instrument types in Table 5, and EU countries to euro area countries in Table 6. To do this, we have to restrict the analysis to bank holdings, due to data availability. In the following tables, we use the securities holdings statistics, restricting the analysis to euro area countries but comparing across holding sectors as well as sectors of the underlying reference entity.

The estimates in Table 5 suggest that 10% larger banking claims are associated with 7% larger CDS holdings on average (Column 1). The relationship seems to be driven by portfolio investment, although other invesment types also play a role in column 3. As could be expected, CDS holdings map to portfolio debt holdings, whereas the relation with portfolio equity is not statistically significant. Therefore in the remainder of the analysis, we concentrate on debt instruments.

Robustness to fixed effects and other controls, along with sample sensitivity, are analysed in Table 6. Columns 1 and 2 report that the results are robust to fixed effects at the holding country level and at the underlying country level, respectively. In column 3, the determinants described above are included as controls, at both the holding country and the underlying country levels simultaneously.[11] This means that larger bilateral portfolio debt assets are associated with an increased amount of CDS holdings over and above the general propensity to be a holding country and over and above the general propensity

[11] See the variables in Table 4.

to have a large underlying market size. In other words, on average EU banking systems purchase larger amounts of CDSs written on financial partner countries. The results are similar for the subset of euro area countries, reported in the last three columns.

Next, we switch to the securities holdings statistics in Table 7. For overall holdings, the results are quantitatively very similar to those using the CPIS. The breakdown by underlying sector in panels B and C indicate that the relationship between debt securities holdings and credit derivatives holdings is stronger when the underlying reference entity is a corporation. This is consistent with the suggested intepretation, which stresses the relevance of financial partners.

Table 8 reports similar results for investment funds. The relation between government securities and CDSs in panel B is weaker than for banks, and not robust across the specifications. In panel C, the link between derivatives and securities holdings in corporations is more significant than for banks, capturing over a third of the variability in column 1. Also for investment funds, aggregate credit derivatives holdings go hand in hand with aggregate securities holdings.

Finally, we study net purchases of CDSs, defined as outstanding amounts on the buy side minus outstanding amounts on the sell side. The results of estimating equation 3 are reported in table 9, differenciating between net buyers and net sellers. A positive coefficient for net buyers means that on average, more net protection is purchased where exposures are larger. A negative coefficient for net sellers means that the long position on the derivatives side follows the direction of the securities position.

Across the board, coefficients tend to be positive for net buyers, and negative for net sellers. When countries are protection buyers, on average they buy more protection where they have larger exposures. This tends to reduce bilateral credit exposures. When countries are protection sellers, they tend to take positions similar to the positions on the securities book, thus amplifying exposures. This result is stronger for banks than for funds – for the latter, the coefficients are not statistically significant. Interestingly, banks net purchases of CDSs on the government sector do not reduce aggregate exposures, therefore

in the case of banks' exposure to sovereigns, credit risk is unambiguosly increased via credit derivatives.

5. Conclusions

This paper is a first attempt to bring financial derivatives into international macro-finance analysis. Given the risk sensitivity of capital flows, it is important to understand how financial derivatives modify the risk profile of international investment linkages. Accordingly, we study the relationship between cross-border holdings of credit derivatives and cross-border investment linkages in the EU. Our results indicate that on a gross basis, credit derivatives linkages map to the financial linkages resulting from international investment flows. This also holds on a net basis for banks – not for funds – with net buyers buying more protection on countries on which they have larger claims, and net sellers selling more protection on countries on which they have larger claims.

The scale of credit derivatives is smaller than international investment positions. While representing a small hedge against day-to-tay valuation changes, these CDS positions represent a potentially significant off-setting of the risks in the underlying investment positions in the case of defaults. In situations of extreme market stress, this may impact capital flows dynamics.

Our research contributes to the topical discussion around the statistical recording of financial derivatives in the context of international financial flows. Currently, derivatives are recorded at replacement value. This measures the materialised (even though revertible) gains and losses from the derivatives position, which give rise to cash flows (recorded in the Balance of Payments) or credit / debt positions (recorded in the International Investment Position), depending on the settlement frequency (i.e. variation margin payments). In contrast, notional amounts of credit derivatives measure the potential gains or losses which may arise in the future, i.e. risk transfer. Similarly, for other types of derivatives, risk transfer can be recorded using appropriate measures. We believe that to understand

the international transmission of shocks via capital flows, it is increasingly important to take risk transfer into account. As such, we support the idea of integrating international investment position statistics with risk transfer statistics based on financial derivatives data.

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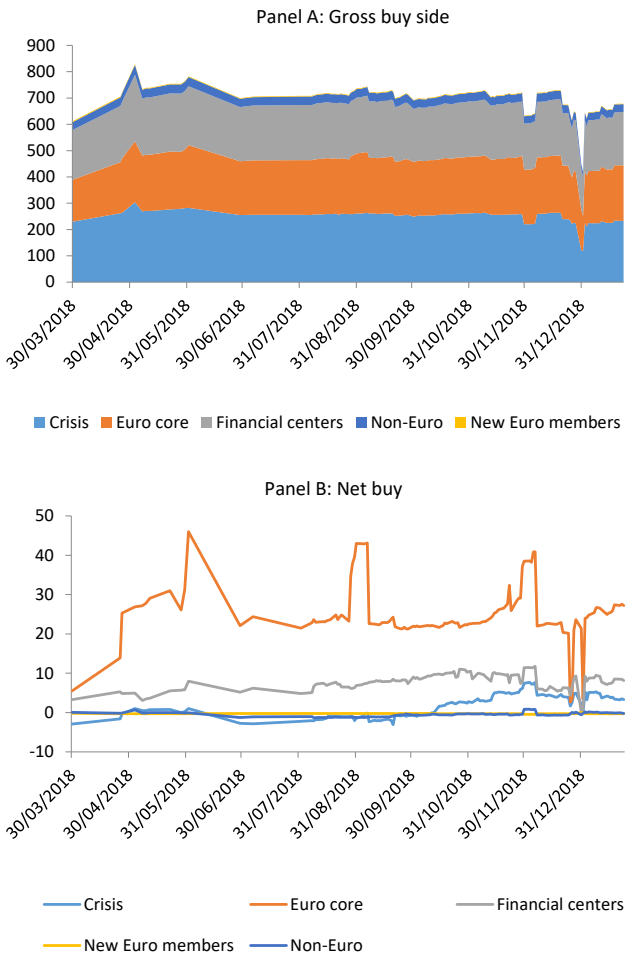
6. Tables and figures

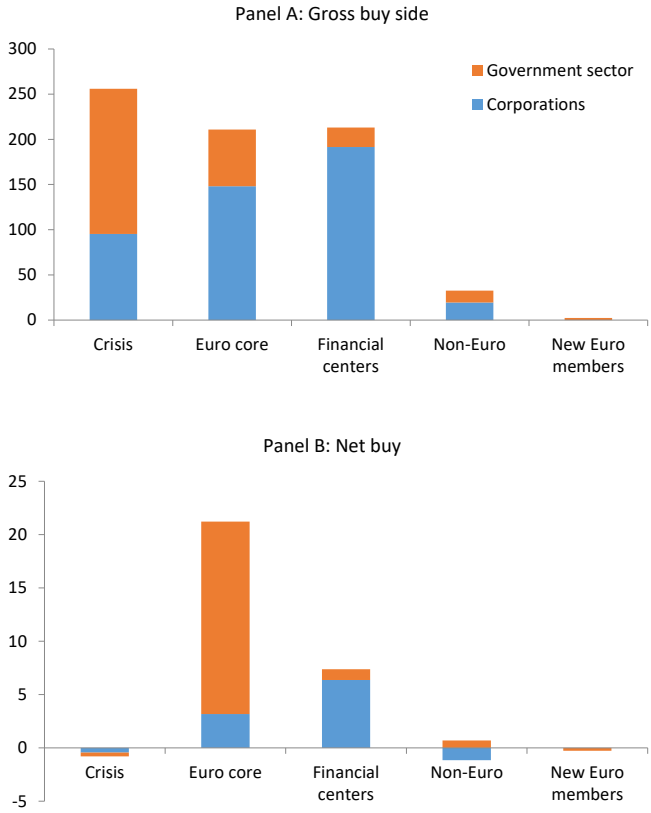
Figure 1: EU cross-border credit derivatives outstanding

(30 March 2018 - 23 January 2019)



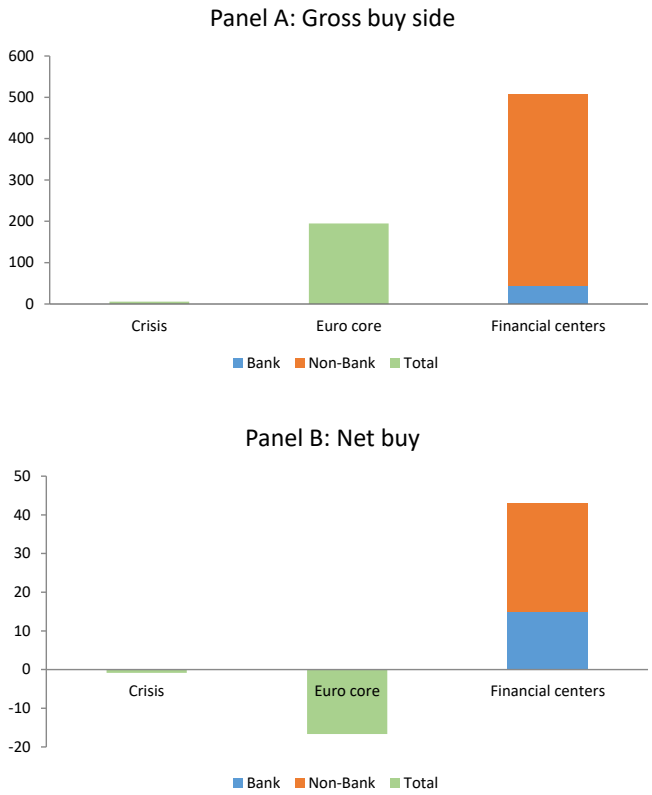
Notes: Euro, billion. Notional amounts of cross-border derivatives purchased by residents of the countries in the groups and with underlying reference entity domiciled in the EU. In panel B, gross sales are subtracted from gross purchases. Financial centres: Belgium, Ireland, Luxembourg, Netherlands, and UK. Euro core: Austria, Finland, France and Germany. Crisis countries: Greece, Italy, Portugal and Spain. Non-euro members: Bulgaria, Croatia, Czech Republic, Denmark, Hungary, Poland, Romania, Sweden and Norway. New euro members: Cyprus, Estonia, Latvia, Lithuania, Malta, Slovakia and Slovenia.

Figure 2: Credit derivatives outstanding by country group and sector of underlying (2018 Q3)



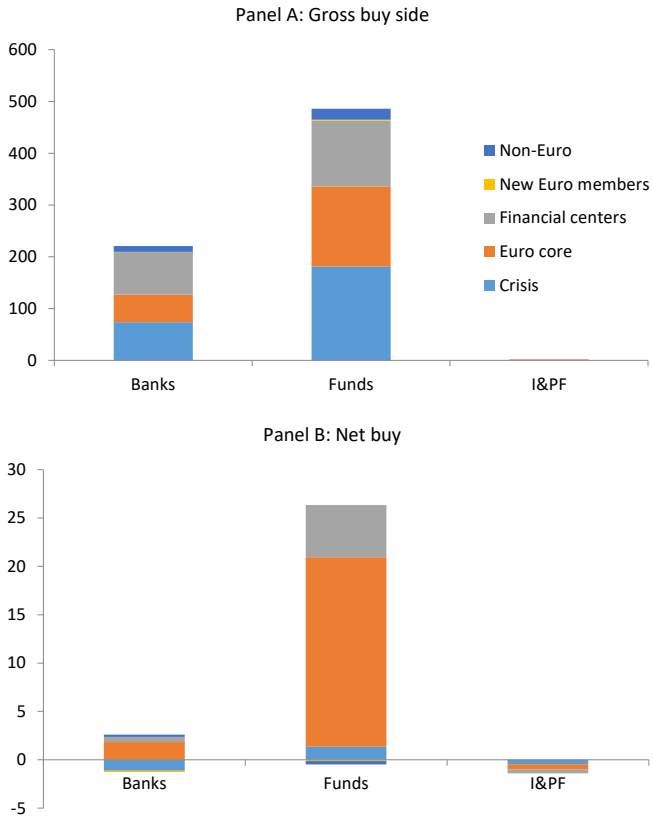
Notes: Euro, billion. Notional amounts of cross-border derivatives purchased by EU residents with underlying reference entity domiciled in the country groups and belonging to the specified sectors. In panel B, gross sales are subtracted from gross purchases. Financial centres: Belgium, Ireland, Luxembourg, Netherlands, and UK. Euro core: Austria, Finland, France and Germany. Crisis countries: Greece, Italy, Portugal and Spain. Non-euro members: Bulgaria, Croatia, Czech Republic, Denmark, Hungary, Poland, Romania, Sweden and Norway. New euro members: Cyprus, Estonia, Latvia, Lithuania, Malta, Slovakia and Slovenia.

Figure 3: Credit derivatives outstanding by reporting country group (2018 Q3)



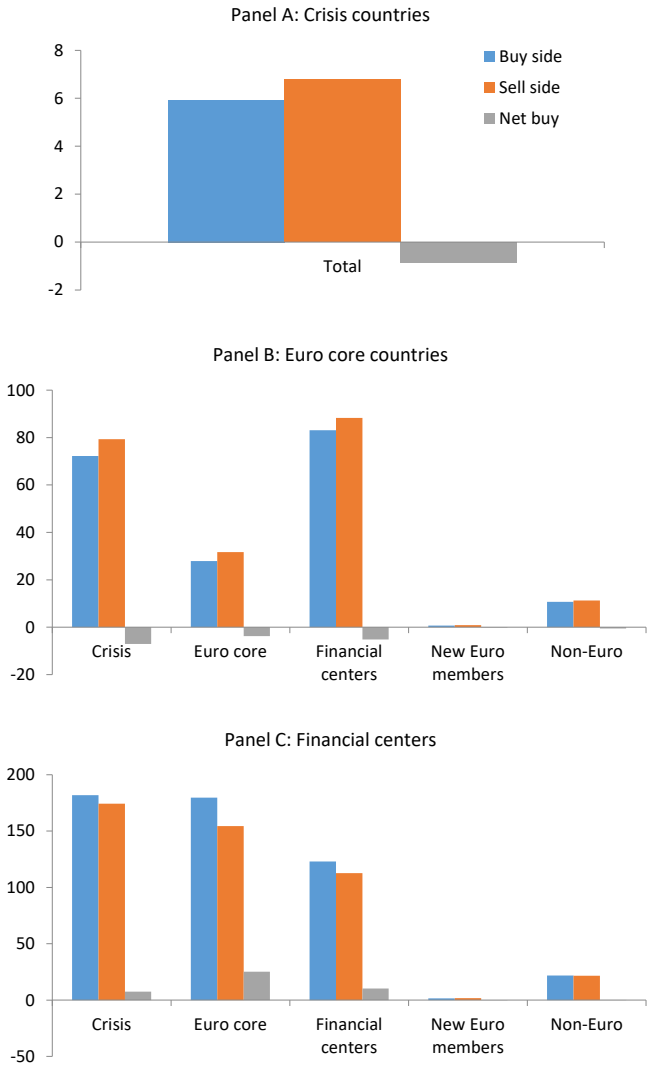
Notes: Euro, billion. Notional amounts of cross-border derivatives purchased by banks and non-banks resident of the countries in the groups and with underlying reference entity domiciled in the EU. In panel B, gross sales are subtracted from gross purchases. Financial centres: Belgium, Ireland, Luxembourg, Netherlands, and UK. Euro core: Austria, Finland, France and Germany. Crisis countries: Greece, Italy, Portugal and Spain.

Figure 4: Credit derivatives outstanding by reporting sector (2018 Q3)



Notes: Euro, billion. Notional amounts of cross-border derivatives purchased by banks, investment funds and insurances and pension funds (I&PF) domiciled in the EU, and with underlying reference entity domiciled in the country goups. In panel B, gross sales are subtracted from gross purchases. Financial centres: Belgium, Ireland, Luxembourg, Netherlands, and UK. Euro core: Austria, Finland, France and Germany. Crisis countries: Greece, Italy, Portugal and Spain. Non-euro members: Bulgaria, Croatia, Czech Republic, Denmark, Hungary, Poland, Romania, Sweden and Norway. New euro members: Cyprus, Estonia, Latvia, Lithuania, Malta, Slovakia and Slovenia.

Figure 5: Credit derivatives outstanding by reporting and underlying country groups (2018 Q3)



Notes: Euro, billion. Panel A plots notional amounts of cross-border derivatives purchased by residents of crisis countries, and with underlying reference entity domiciled in the EU. Panel B plots notional amounts of cross-border derivatives purchased by residents of euro core countries, and with underlying reference entity domiciled in the country groups. Panel C plots notional amounts of cross-border derivatives purchased by residents of financial centres, and with underlying reference entity domiciled in the country groups. Country groupings as in previous figures.

Table 1: Credit derivatives outstanding, by country of the underlying reference entity

Country	Buy side	Sell side	Buy-Sell
DE	96.7	78.6	18.1
GB	196.9	192.9	4.1
FR	127.6	124.0	3.5
NL	100.4	96.9	3.5
LU	33.7	30.4	3.3
IE	13.7	12.4	1.4
FI	8.9	8.1	0.9
AT	7.5	6.9	0.7
ES	58.5	57.9	0.6
DK	6.4	5.8	0.5
HU	2.4	2.1	0.2
GR	1.1	0.9	0.2
PT	13.1	13.0	0.1
RO	1.1	1.0	0.1
CY	0.2	0.2	0
BG	0.3	0.3	0
SI	0.4	0.4	0
HR	3.3	3.3	0
CZ	0.6	0.6	0
LV	0.6	0.7	-0.1
LT	0.7	0.8	-0.1
SK	0.5	0.6	-0.1
PL	1.8	1.9	-0.1
SE	17.7	18.4	-0.8
BE	16.1	17.2	-1.1
IT	185.7	187.5	-1.8
Total	**895.9**	**862.9**	**33.0**

Notes: Euro, billion. Notional amounts of cross-border derivatives purchased by EU residents with underlying reference entity domiciled in the countries listed. (Cross-border in the sense that the holder is not a resident of the country of residence of the underlying reference entity.) In the last column, gross sales are subtracted from gross purchases.

Table 2: Domestic credit derivatives outstanding

	Reporting counterparty domestic			Both counterparties domestic		
Country	**Buy**	**Sell**	**Buy-Sell**	**Buy**	**Sell**	**Buy-Sell**
DE	3.2	4.5	-1.3	0.3	0.3	0.0
FR	23	20.7	2.3	4.7	4.8	-0.1
GB	141.3	136.1	5.2	64.7	68.3	-3.6
IE	0.1	0.4	-0.3	*	*	*
LU	0.4	0.7	-0.3	*	*	*
NL	*	0.2	*	*	*	*

Notes: Euro, billion. Notional amounts of derivatives purchased by residents of the countries listed and with underlying reference entity domiciled in the countries listed. In the last three columns, also the other counterparty is resident in the same country as the reporting counterparty and the underlying reference entity. Stars are shown when data are confidential.

Table 3: Market concentration and number of participants

	Largest two %		Number of entities	
	Buy side	Sell side	Buy side	Sell side
Crisis	90%	87%	12	46
Euro core	67%	66%	272	482
Crisis	65%	62%	80	132
Euro core	64%	62%	49	104
Financial centers	72%	71%	93	166
New Euro members	81%	57%	6	11
Non-Euro	71%	70%	44	69
Financial centers	43%	47%	1123	1243
Crisis	49%	49%	256	322
Euro core	41%	46%	352	364
Financial centers	40%	44%	388	431
New Euro members	58%	55%	10	11
Non-Euro	45%	47%	117	115

Notes: Concentration ratios and number of holding entities. In bold is the residence of the holding entity (country groups as in Figures **??**). Below each holder country group, a breakdown is shown by country of the underlying reference entity.

Table 4: Determinants of cross-border credit derivatives holdings

	All underlying entities			Underlying entity: Government		
	All	Banks	Funds	All	Banks	Funds
Log Population HC	2.33***	2.45***	2.41**	2.35***	2.07***	0.93
	(0.40)	(0.41)	(1.03)	(0.56)	(0.39)	(0.72)
Log GDP PC HC	5.10***	1.98**	8.85**	7.48***	3.02	9.47**
	(1.38)	(0.78)	(3.23)	(2.04)	(1.82)	(3.01)
Credit-to-GDP HC	0.54	0.49	0.71	0.50	0.47	-0.41
	(0.40)	(0.38)	(0.62)	(0.36)	(0.31)	(0.46)
Govt debt ratio HC	0.19	-0.09	0.45	0.40	-0.01	1.13***
	(0.27)	(0.15)	(0.33)	(0.23)	(0.14)	(0.24)
IFI ratio HC	0.003*	0.01***	-0.0002	0.0004	0.001	0.001
	(0.001)	(0.001)	(0.003)	(0.001)	(0.001)	(0.002)
Log Population UC	0.92***	0.67**	0.74*	**0.31**	**0.37*** **	**0.29**
	(0.21)	(0.25)	(0.35)	(0.21)	(0.12)	(0.24)
Log GDP PC UC	1.35***	1.50**	0.79	1.17**	0.88	1.59
	(0.44)	(0.54)	(0.49)	(0.45)	(0.53)	(0.96)
Credit-to-GDP UC	0.18*	0.21*	0.24**	-0.16	0.09	**-0.39**
	(0.10)	(0.11)	(0.10)	(0.10)	(0.11)	(0.24)
Govt debt ratio UC	0.13**	0.13*	0.18**	0.27***	**0.28*** **	0.33***
	(0.04)	(0.06)	(0.06)	(0.06)	(0.07)	(0.08)
IFI ratio UC	0.002	0.0001	0.001**	-0.01	-0.002	-0.01
	(0.001)	(0.001)	(0.001)	(0.01)	(0.005)	(0.01)
Constant	-39.59***	-26.80***	-53.49**	-46.45***	-26.06**	-49.81***
	(7.75)	(5.55)	(18.47)	(11.15)	(8.32)	(14.38)
Observations	157	134	116	98	78	66
R-squared	0.59	0.56	0.50	0.59	0.59	0.68

Notes: Dependent variable is the log notional amount of cross-border credit derivatives purchased by residents in the EU and outstanding at the end of September 2018. RC is reporting country; CC is counterparty country. Ratios are in decimals; logs are base ten; population is in thousand. *GDP PC* is GDP per-capita; *Credit-to-GDP* is the credit to the private non-financial sector divided by GDP; *Gov debt ratio* is government debt securities outstanding divided by GDP; *IFI ratio* is the sum of external assets an liabilities divided by GDP. Standard errors clustered at the holding country level are reported in parenthesis. *** denotes 1% significance level; ** denotes 5% significance level; * denotes 10% significance level. Bold coefficients in the last three columns denote statistically significant difference with coefficients estimated using credit derivatives on corporations, as opposed to government which is reported here.

Table 5: Credit protection purchased and bilateral banking claims

	(1) LBS	(2) CPIS	(3) LBS&CPIS	(4) CPIS	(5) CPIS
All claims	0.71***				
	(0.10)				
Portfolio investment		0.72***	0.40**		
		(0.13)	(0.14)		
Other			0.38**		
			(0.12)		
Portfolio debt				0.60**	0.52**
				(0.21)	(0.23)
Portfolio equity					0.19
					(0.12)
Constant	-0.77**	-0.35	-0.70*	0.16	0.00
	(0.33)	(0.40)	(0.34)	(0.65)	(0.63)
Observations	148	139	128	122	104
R-squared	0.35	0.34	0.37	0.29	0.34

Notes: Dependent variable is the log notional amount of cross-border credit derivatives purchased by EU banks and outstanding at the end of September 2018. Right-hand side variables are banks bilateral claims from the BIS locational banking statistics, or the IMF coordinated portfolio investment survey, or both. Standard errors clustered at the holding country level are reported in parenthesis. *** denotes 1% significance level; ** denotes 5% significance level; * denotes 10% significance level.

Table 6: Credit protection purchased and portfolio debt claims of banks

	EU Holders			EA holders		
	(1)	(2)	(3)	(4)	(5)	(6)
Portfolio debt	0.58**	0.64**	0.26**	0.69***	1.04***	0.27*
	(0.21)	(0.23)	(0.10)	(0.17)	(0.12)	(0.13)
Constant	-1.24	0.03	-22.31**	-1.60**	-1.74**	-15.27*
	(0.69)	(0.91)	(9.17)	(0.54)	(0.59)	(7.03)
FE/Controls?	HC	UC	Controls	HC	UC	Controls
Observations	122	122	107	84	84	70
R-squared	0.57	0.44	0.66	0.70	0.55	0.81

Notes: Dependent variable is the log notional amount of cross-border credit derivatives purchased by EU or Euro Area banks and outstanding at the end of September 2018. Explanatory variable is portfolio debt holdings from the CPIS. Columns 1 and 4 include holding country fixed effects; columns 2 and 5 include underlying country fixed effects; columns 3 and 6 include controls at both the holding country and the underlying country levels, as in Table 4. Standard errors clustered at the holding country level are reported in parenthesis. *** denotes 1% significance level; ** denotes 5% significance level; * denotes 10% significance level.

Table 7: Banks holdings by underlying sector

Panel A: All underlying entities

	(1)	(2)	(3)	(4)
Log debt securities	0.67***	0.70***	0.94**	0.34**
	(0.10)	(0.15)	(0.30)	(0.13)
Constant	-0.11	-1.62***	-1.25	-16.04*
	(0.28)	(0.47)	(0.98)	(8.09)
FE/Controls?	No	HC	UC	Controls
Observations	109	109	109	93
R-squared	0.30	0.66	0.43	0.62

Panel B: Government

	(1)	(2)	(3)	(4)
Log debt securities	0.38**	0.47**	0.67**	0.17
	(0.11)	(0.14)	(0.23)	(0.12)
Constant	0.95**	-0.79	-0.22	-31.74
	(0.27)	(0.43)	(1.05)	(16.97)
FE/Controls?	No	HC	UC	Controls
Observations	65	65	65	51
R-squared	0.18	0.59	0.38	0.65

Panel C: Corporations

	(1)	(2)	(3)	(4)
Log debt securities	0.82***	0.66***	0.91**	0.25
	(0.17)	(0.13)	(0.31)	(0.18)
Constant	-0.59	-1.55***	-1.22	-23.72*
	(0.59)	(0.44)	(1.02)	(12.92)
FE/Controls?	No	HC	UC	Controls
Observations	75	75	75	74
R-squared	0.28	0.65	0.39	0.61

Notes: Dependent variable is the log notional amount of cross-border credit derivatives purchased by euro area banking systems and outstanding at the end of September 2018. Explanatory variable is the log nominal value of debt securities from the Securities Holdings Statistics. Column 2 includes holding country fixed effects; column 3 includes underlying country fixed effects; column 4 includes controls at both the holding country and the underlying country levels, as in Table 4. Standard errors clustered at the holding country level are reported in parenthesis. *** denotes 1% significance level; ** denotes 5% significance level; * denotes 10% significance level.

Table 8: Investment funds holdings by underlying sector

Panel A: All underlying entities

	(1)	(2)	(3)	(4)
Log debt securities	0.53***	0.82***	0.70***	1.02**
	(0.10)	(0.13)	(0.18)	(0.36)
Constant	0.10	0.10	-0.99	-0.41
	(0.57)	(0.19)	(0.83)	(15.75)
FE/Controls?	No	HC	UC	Controls
Observations	96	96	96	86
R-squared	0.27	0.69	0.46	0.53

Panel B: Government

	(1)	(2)	(3)	(4)
Log debt securities	0.25	0.51***	0.28	0.20*
	(0.14)	(0.12)	(0.34)	(0.08)
Constant	1.22**	0.20	1.15	-31.67**
	(0.43)	(0.48)	(1.28)	(11.81)
FE/Controls?	No	HC	UC	Controls
Observations	56	56	56	48
R-squared	0.11	0.42	0.40	0.58

Panel C: Corporations

	(1)	(2)	(3)	(4)
Log debt securities	0.76***	0.88***	0.74***	1.88**
	(0.14)	(0.15)	(0.19)	(0.59)
Constant	-0.78	0.01	-1.22	46.84**
	(0.57)	(0.22)	(0.68)	(16.78)
FE/Controls?	No	HC	UC	Controls
Observations	74	74	74	72
R-squared	0.38	0.76	0.48	0.68

Notes: Dependent variable is the log notional amount of cross-border credit derivatives purchased by the investment fund sector in different euro area countries, outstanding at the end of September 2018. Explanatory variable is the log nominal value of debt securities from the Securities Holdings Statistics. Column 2 includes holding country fixed effects; column 3 includes underlying country fixed effects; column 4 includes controls at both the holding country and the underlying country levels, as in Table 4. Standard errors clustered at the holding country level are reported in parenthesis. *** denotes 1% significance level; ** denotes 5% significance level; * denotes 10% significance level.

Table 9: Net protection purchased and debt securities holdings

Panel A: All underlying entities

	Net buyers		Net sellers	
	Banks	Funds	Banks	Funds
	(1)	(2)	(3)	(4)
Debt securities	0.02	0.003	-0.03***	-0.003*
	(0.02)	(0.003)	(0.002)	(0.001)
Constant	84.06*	486.28	-23.88	-70.30**
	(45.65)	(407.40)	(100.86)	(26.34)
Observations	65	44	53	65
R-squared	0.08	0.002	0.47	0.11

Panel B: Government

	Net buyers		Net sellers	
	Banks	Funds	Banks	Funds
	(1)	(2)	(3)	(4)
Debt securities	-0.001	0.001	-0.02***	-0.01
	(0.004)	(0.01)	(0.003)	(0.002)
Constant	82.21**	926.25	-98.48*	-99.15**
	(14.26)	(999.82)	(41.59)	(34.80)
Observations	24	22	32	28
R-squared	0.001	0.0003	0.33	0.08

Panel C: Corporations

	Net buyers		Net sellers	
	Banks	Funds	Banks	Funds
	(1)	(2)	(3)	(4)
Debt securities	0.07***	0.005	-0.02**	-0.003
	(0.01)	(0.003)	(0.01)	(0.002)
Constant	61.68	79.81	-193.95	-78.24**
	(51.53)	(56.50)	(220.14)	(31.00)
Observations	30	32	26	37
R-squared	0.31	0.15	0.29	0.13

Notes: Dependent variable is the net credit protection purchased by euro area entities aggregated at the country-sector level, outstanding at the end of September 2018 (notional amount). Explanatory variable is the nominal value of debt securities held from the Securities Holdings Statistics. The first two columns of each panel restrict the sample to positive net bilateral positions; the third and fourth columns restrict sample to positive net bilateral positions. Standard errors clustered at the holding country level are reported in parenthesis. *** denotes 1% significance level; ** denotes 5% significance level; * denotes 10% significance level.

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