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The Impact of State Guarantees on Banks' Debt Issuing Costs, Lending and Funding Policy

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Study on behalf of EC DG Economic and Financial Affairs

Prepared by London Economics
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Abstract

On behalf of DG ECFIN, London Economics carried out an empirical study on the effectiveness of state guarantees given to banks in 2008-10. It analysed the market value of state guarantees as reflected in banks' issuing costs and whether there were significant differences visible in the balance sheets of banks that used state guarantees and those that refrained from using them. The report presents a comprehensive ex-post evaluation of one of the main tools to restore the functioning of wholesale financial markets after the Lehman bankruptcy. The results of the empirical research suggested that the guarantee schemes were successful in lowering the costs of bond issuance of participating banks while having relatively little distortionary impacts on non-participating banks. Moreover, cross-border spill-over appear to be non-existent. Though the report stresses that the estimates do not necessarily suggest causalities, the following results are noteworthy:

- **Market value of state guarantees:** The direct effect from the use of state guarantees (SG) was limited to about 30 basis points, i.e. investors were prepared to accept 30 basis points less for a comparable debt security issued by a bank with a state guarantee than without one. Moreover, there was a second upgrade effect, insofar as lower-rated banks were able to issue bonds with a superior rating. This effect had sizeable statistically significant impact on the issuing costs of bonds rated BBB-/BBB/BBB+, in the order of over 200bps. In contrast to other research, there was no evidence found that differences across guarantors, i.e. related to different ratings of the Member State providing the guarantee, had a significant impact on issuing costs.

- **Spill-over:** While each individual state-guaranteed bond issue benefited from the state guarantee through a lower issue cost, all bond issues (state guaranteed and non-state guaranteed) were impacted negatively by the overall volume of state-guaranteed bond issues during a month. Quantitatively, each bond issue faced a higher issuance cost of 10.5bps, on average, as a result of the overall volume of state-guaranteed issuance activity in a given month. This indirect effect is entirely domestic, as the monthly volume of state-guaranteed bond issues outside a Member State is not found to impact on the issuance cost of state-guaranteed and non-state- guaranteed bonds in the domestic market.

- **Bank behaviour**: The econometric analysis shows that banks that issued state-guaranteed bonds a) lent less than banks that were eligible to issue state-guaranteed bonds but did not so and b) reduced their leverage ratio. The descriptive statistical analysis covers further variables and suggests that banks having issued guaranteed bonds in the following year increased their short-term and long-term funding by more, their equity capital by less and show a worse post-issue profit performance than banks having issued non-guaranteed bonds.

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We would like to acknowledge the useful guidance and feedback provided by EC DG Competition, EC DG Economic and Financial Affairs and EC DG Internal Market and Services throughout this research. The aforementioned Directorate-Generals also provided us with some of the data that were employed in our analysis.

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Glossary

BGN	Bloomberg Generic
CBBT	Composite Bloomberg Bond Trade
HRE	Hypo Real Estate
SG	State guaranteed
Non-SG	Non-state guaranteed
TRACE	Trade Reporting and Compliance Engine

Member State abbreviations

BE	Belgium	LU	Luxembourg
BG	Bulgaria	HU	Hungary
CZ	Czech Republic	MT	Malta
DK	Denmark	NL	Netherlands
DE	Germany	AT	Austria
EE	Estonia	PL	Poland
EL	Greece	PT	Portugal
ES	Spain	RO	Romania
FR	France	SI	Slovenia
IE	Ireland	SK	Slovakia
IT	Italy	FI	Finland
CY	Cyprus	SE	Sweden
LV	Latvia	UK	United Kingdom
LT	Lithuania		

Executive summary

When wholesale financial markets dried up in autumn 2008 and banks faced severe problems in re-financing their debt, state guarantees were one of the first tools used by Member States to support banks. The motivation of the provision of state guarantees was to help solvent but illiquid banks issue debt securities in the maturity spectrum of 1-5 years after the Lehman Brothers collapse, thereby complementing central bank support that focused on the provision of short-term liquidity.

The present report examines the impact on financial markets of the Member States' debt issue guarantee schemes and ad hoc guarantees offered to banks in the wake of the financial crisis of 2008. It investigates: (i) the effectiveness of state guarantees by analysing supported banks' issuance activity on medium-term debt security markets; (ii) development of capital costs; and (iii) whether effects are visible in differences in banks' performance and risk-taking as reflected in balance sheet data between banks using and not-using state guarantees and between banks before and after issuing guaranteed debt.

Overall, the empirical results suggest that guarantee schemes were successful in lowering the costs of bond issues of participating banks while having relatively little distortionary impacts on non-participating banks. Moreover, cross-border spill-overs appear to be non-existent. Therefore, the design of schemes can be said to have been relevant, appropriate and well targeted. Access, however, may have been overly generous in the sense that some issuance of state guaranteed bonds continued through 2010, a period during which financial market conditions had stabilised to some degree.

Overview of state guarantee schemes

The study focuses on the period 25 October 2008 to 31 December 2010. The starting period is the date of the Communication of the European Commission, The application of State aid rules to measures taken in relation to financial institutions in the context of the current global financial crisis

Between October 2008 and December 2010 close to 1,000 state-guaranteed bond issues were brought to market with a face value of more than €700billion. Almost 50% of the issuances in number and more than 50% in volume took place in the 11 month period of November 2008 to July 2009.

The overall volume of guarantees granted over the period October 2008 – December 2010 varies markedly across Member States, ranging from €164 billion in the UK to €0 in 8 Member States (Bulgaria, Czech Republic, Estonia, Italy, Lithuania, Malta, Romania, and Slovakia). Overall, 5 Member States (Denmark, France, Germany, Ireland and United Kingdom) account for almost 80% of the total volume of state guarantees granted during the period.

When taking account of the different sizes of the economies of the Member States, the overall volume of guarantees granted exceeds 100% of GDP in 2 Member States (Denmark, Ireland), ranges from 50% to 100% in 1 Member State (Belgium), ranges from 25% to 50% of GDP in 5 Member States (Austria, Greece, Netherlands, Sweden, Slovenia) and is less than 25% of GDP in 13

Member States (Cyprus, Finland, France, Germany, Hungary, Latvia, Lithuania, Luxembourg, Poland, Portugal, Spain, Slovakia, United Kingdom).

The majority of banks participating in the state guarantee scheme issued only state-guaranteed bonds during the period covered by the study while a minority issued both state guaranteed and non-state guaranteed bonds.

The majority of state guaranteed bond issues had a maturity of 3 to 5 years, the maximum tenor permitted under the scheme.

Empirical analysis of issuing costs

The statistical analysis of the impact of the provision of a state guarantee to a short- to medium-term bond issue shows that, on average, the market value of state guarantees was 33bps.

The empirical result that the presence of a state guarantee reduces issuance costs is robust across a number of models and variable specifications. But, the estimated magnitude of the impacts varies somewhat, ranging from 18 bps to 57 bps.

A more detailed estimation, allowing for impact to vary across the actual size of issuance costs shows that, with the exception of the banks facing the highest issuance costs, the estimated impact of state guarantees on issuance costs increases with the level of issuance costs.

Moreover, there is evidence of a ratings upgrade effect insofar as state guarantees had a sizeable statistically significant impact on the issuing costs of bonds rated BBB-/BBB/BBB+, in the order of over 200bps.

While each individual state guaranteed bond issue benefited from the state guarantee through a lower issue cost, all bond issues (state guaranteed and non-state guaranteed) were impacted negatively by the overall volume of SG bond issues during a month. Quantitatively, each bond issue faced a higher issuance cost of 10.5bps, on average, as a result of the overall volume of SG issuance activity in a given month.

Moreover, this negative impact is marginally higher for non-state guaranteed bonds issued by banks which did not participate in the scheme (0.07 bps for each tranche of €1billion in state guaranteed bonds issued) than for bonds (state guaranteed and non-state guaranteed) issued by participating banks. In the case of the latter, only state guaranteed bond issues were impacted.

This indirect effect is entirely domestic as the monthly volume of state guaranteed bond issues outside a Member State is not found to impact on the issuance cost of state guaranteed and non-state guaranteed bonds in the domestic market.

Empirical analysis of the impact on bank lending, funding and profitability performance

The impact on bank lending, funding and profitability of the provision of state guarantees to bond issues by banks varies. A simple, descriptive analysis of the impact of the guarantees provided in 2009 shows that in the following year (i.e., 2010),

- banks having issued guaranteed bonds increased their net loan book by less than banks having issued noon-guaranteed bonds that would have been eligible;

- however, these banks increased their short-term and long-term funding by more than banks having issued non-guaranteed bonds and their equity capital by less;
- moreover, the banks having issued guaranteed bonds show a worse post-issue profit performance (measured either by ratio of net interest income to total liabilities and equity or operating income to total liabilities and equity).

A more detailed statistical analysis shows that the simple categorisation into banks issuing SG bonds and banks not having issued SG bonds is often not granular enough to assess the full impact of the state guarantee schemes on various outcomes at the bank level.

The results of the econometric analysis shows banks that issued SG bonds a) lent less than banks that were eligible to issue SG bonds but did not so and b) reduced their leverage ratio.

Overall, the statistical results presented in the study suggest that the guarantee schemes were successful in lowering the costs of bond issues of participating banks while having relatively little distortionary impacts on non-participating banks. Moreover, cross-border spill-overs appear to be non-existent.

In that regard, to the extent that the objective of the state guarantee schemes was to reduce the cost of funds for banks, the design of the schemes can be said to have been relevant, appropriate and well targeted.

Access, however, may have been overly generous in the sense that some issuance of state guaranteed bonds continued through 2010, a period during which financial market conditions had stabilised even though they had not yet returned to normal.

More importantly, the detailed statistical analysis suggest that is the intensity of usage of the guarantee schemes and not mere participation in the scheme which determines whether banks having participated in the state guarantee schemes expanded their net lending. This observation suggests that, in the future, one may wish to subject participation in a similar state aid scheme to a minimum size in order to achieve a positive bank lending impact. Obviously, the minimum participation size should be determined in relation to the size of the participating bank.

That being said, it is critical to note that a simple comparison of the pre-issue and post-issue lending, funding and profit performance of participating and non-participating banks shows that neither of the two sets of banks are homogenous groups and that actual outcomes in terms of lending, funding and profitability of each bank shows a great dispersion around the mean of each group.

Therefore, one should be very prudent in drawing any policy conclusions concerning scheme design and effectiveness with regards to bank outcomes.

1 Introduction

1.1 Background

When wholesale financial markets dried up in autumn 2008 and banks faced severe problems in re-financing their debt, state guarantees were one of the first tools used by Member States to support banks. The motivation of the provision of state guarantees was to help solvent but illiquid banks issue debt securities in the maturity spectrum of 1-5 years after the Lehman Brothers collapse, thereby complementing central bank support that focused on the provision of short-term liquidity. By shifting the risk from the private to the public sector, the provision of state guarantees targeted the reduction of the counterparty risk, which hampered the proper functioning of wholesale financial markets, and the containment of systemic risk.

From autumn 2008 onwards, 19 EU Member States offered guarantees on banks' liabilities either through generalised schemes or through *ad hoc* interventions. The approved amount through generalised schemes totals almost €2,500bn, which represents 20% of GDP. Of this amount, €712bn, i.e. 5.8 % of GDP was actually taken up by banks. In particular, in the first half of 2009, banks made extensive use of the issuance of state-guaranteed bonds. Since then, the number of issuances and the amount issued through state guaranteed bonds has ebbed.

The December 2009 European Council concluded that "the phasing-out of support should start with government guarantees." At the beginning of 2010, France, Italy and the United Kingdom discontinued their guarantee schemes and the Netherlands introduced a price increase for its guarantees. However, in light of the fragility of the economic recovery and financial conditions, other Member States prolonged their schemes.

Since the state guarantees constitute state aid, which is inconsistent with Internal Market rules except under specific conditions (Article 107 TFEU), the Member States' guarantee schemes as well as ad hoc guarantees to individual banks had to be notified to and approved by the European Commission. In its assessment of Member States guarantee schemes, the Commission considered their potential to distort competition among banks that could use state guarantees and those that could not as well as between Member States with different designs of the guarantee schemes or none at all. In order to minimise distortions to competition, the Commission established criteria of eligibility, remuneration and conditionality that Member States had to observe when they provided state guarantees to banks.

Although the Commission was aware that these criteria could reduce but not exclude market distortions arising from the use of state guarantees, the risk was considered as being counterbalanced by the contribution of guarantees to restoring financial stability. In the first months after the Lehman Brothers collapse, observers expressed concerns that the criteria set by the Commission were too tight and discouraged the use of guarantees. As the risks to financial stability receded over time, competition concerns gained in importance. Numerous banks were able to raise capital through the issuance of securities without a guarantee and many of those that continued to rely on the use of state guarantees were under restructuring obligation due to their additional use of other forms of state aid.

1.2 Study scope

This study focuses on the EU27 Member States' guarantee schemes and *ad hoc* guarantees to banks[1] in the period 25 October 2008[2] – 31 December 2010.

State guarantees to wholesale deposits and short- and medium-term debt instruments that were not adequately protected by investor arrangements or other means are considered in this study. State guarantees to retail deposits and debt held by retail clients that were also issued in the period are outside of the scope of the study.

1.3 Study objectives

The overarching objectives of this study are to:

- Investigate the effectiveness of state guarantees to the proper functioning of the banking system. In particular, to inform the use and design of state guarantees in the future.
- Determine how state guarantees affect the functioning of wholesale capital markets. Specifically, to determine whether characteristics of state guarantees used "to remedy a serious disturbance in the economy of a Member State"[3] caused distortions to competition.

The specific objectives of this study are to analyse the impact and effectiveness of state guarantees with respect to:

- **Financial stability** by analysing supported banks' issuance activity on medium-term debt security markets and the development of capital costs.
- **Distortions to competition** between institutions using the schemes and those not using them and across EU Member States.
- **Financial market integration** or fragmentation due to the organisation of guarantee schemes along national lines and differences in the design of schemes across EU Member States.

[1] Banks are defined in a non-legal sense in this study as financial services firms that were able to avail themselves of a state guarantee.

[2] Member States' guarantees to banks had to follow a number of common EU principles when the 'Communication from the Commission: The application of State aid rules to measures taken in relation to financial institutions in the context of the current global financial crisis' (European Commission, 2008) was issued on 25 October 2008. This date therefore serves as a suitable point at which to begin evaluating guarantee schemes' collective impact.

[3] See Article 87(3)(b) in European Commission (2004).

1.4 Research questions

The abovementioned study objectives are addressed by providing empirical results on issuing costs and bank outcomes as follows.

Issuing costs

- Differences in issuing costs between banks making use of state guarantees and those not making use of them when controlling for rating and possibly other bank-specific and issuance-specific variables
- The significance of spill-over from the issuance of state guaranteed bonds to the issuance costs of banks that tapped capital markets without relying on state guarantees
- The existence of competitive advantages and disadvantages visible in issuing costs arising from differences in the rating of the sovereign

Bank outcomes

- Differences in banks' performance and risk-taking as reflected in balance sheet data between banks using and not-using state guarantees and between banks before and after issuing guaranteed debt
- Differences in the provision of credit to the economy between banks using and not-using state guarantees
- The extent state guarantees significantly improved banks' access to medium-term debt markets

1.5 Previous studies

In general, researchers face two key challenges in evaluating the impact of state guarantees such as the schemes covered by the present study. Firstly, there may be lags between participation in state guarantee schemes and impacts. Therefore, the full effect of state guarantees may not yet have fully materialised, especially at the time at which previous studies were conducted. Secondly, it is problematic to discern long-term impacts from the influence of other events and market developments in general the greater the time elapsed between intervention and evaluation.

An additional problem relates to the reliance on outcome variables as a means of assessing the impact of state guarantees on bank behaviours. As supply side interventions, our interest in state guarantee schemes is their influence on bank decision-making (e.g. to lend). But, our reliance on outcome variables does not allow us to differentiate between supply side and demand side effects. If state guarantees were correlated with an increase in bank lending, it may be that banks used greater access to wholesale funding through state guarantees to lend more. However, it may have been that increased demand for loans was the underlying cause of an increase in bank lending. Conversely, state guarantees may have improved banks' lending capacity but limited demand for loans resulted in little change in the level of credit extended.

With these caveats in mind, previous studies have suggested that state guarantee schemes have been less effective than other measures such as recapitalisation or asset relief. These studies, most of them being conducted by central banks, the IMF or the European Commission[4], apply a case study approach, analysing the development of CDS spreads and other market prices around the time of the announcement of financial sector rescue measures. Their finding of a relatively modest impact of state guarantees on financial stability is also supported by the observations that the take up rate was smaller than for other measures.

1.6 Study strategy

This study builds on previous studies in the following ways.

We focus on the actual use of state guarantees by banks through an analysis of data on issue-, bank-, guarantor- and market-specific variables. This includes information on financial market activity (bond yields, amounts issued and others), bank performance and risk (profitability, capital ratios and others), guarantor characteristics (sovereign ratings, CDS spreads and others) and indicators of financial stability (volatility indices, commitments and outlays of state guarantee schemes and others).

We consider the period October 2008 to December 2010, which includes more recent data regarding experiences with state guarantees not previous considered.

We extend the geographic scope of many previous studies that focus on the euro area and the UK or individual Member States to all EU Member States with state guarantee schemes or that have provided *ad hoc* guarantees. Additionally, by focusing on these countries and not others, such as the US, it provides a clearer indication of the empirical impact for the EU.

The strategy of this study is to undertake like-for-like comparisons across bonds/banks included and not included in state guarantee schemes having controlled for other factors. By using a benchmark of bonds/banks not included in state guarantee schemes we attempt to isolate the pure effects of state guarantees. This is a departure from the abovementioned body of work that concentrates, for instance, on state guaranteed bonds only (without non-state-guaranteed bonds as a reference point).

1.7 Report structure

The present report provides an overview of state guarantee schemes in Section 2 before discussing empirical results relating to the research questions on issuing costs and bank outcomes.

Section 3 provides an analysis of wholesale funding market conditions through issuing costs of state guaranteed bonds. This includes descriptive statistics of developments in issuing costs and an

[4] See for example Panetta, F. et al. (2009), "An assessment of financial sector rescue packages", BIS paper No 48; IMF (2009), "Global Financial Stability Report", October 2009; Y. Ait-Sahalia, Y. et al. (2009), "How to stop a herd of running bears? Market response to policy initiatives during the global financial crisis", IMF Working Paper 09/24. DG ECFIN (2009), "The effectiveness of banking support measures: evidence from CDS spreads", Box in Quarterly Report on the Euro Area 4/2009. Ejsing, J. and W. Lemke (2009), "The Janus-Headed Salvation: Sovereign and Bank Credit Risk Premia during 2008-09" ECB Working Paper No. 1127. See also Levy, A. and A. Zaghini (2010), "The Pricing of Government-Guaranteed Bank Bonds, Banca d'Italia Temi di Discussione, No 753, March 2010.

analysis of the latter's relationship to key factors such as issuer and sovereign ratings and indicators of confidence in financial markets. These relationships are investigated formally through an estimation of the impact of state guaranteed bonds in issuing costs. In addition, the impact of state guaranteed bonds as a class on the issuing costs of non-state-guaranteed bonds is estimated. Taken together, the results of this section provides empirical results on the trade-off between the effectiveness of state guarantees to banks participating in state guarantee schemes (or receiving ad hoc guarantees) and the extent of spill-over to non-participating banks.

Section 4 considers the impact of state guaranteed bonds to banks on a number of bank outcomes, including lending and risk-taking. This section proceeds in a similar fashion to Section 3, first providing a descriptive analysis of changes in key bank outcomes and then reporting formal estimation results of the impacts of state guarantees.

Section 5 distils the main findings of the report into policy recommendations.

And, Annex 1-Annex 8 provides technical details and other relevant background material.

2 Overview of state guarantee schemes

2.1 Introduction

The intensification of the financial crisis had marked impacts on the EU banking sector, particularly through 2008Q4. This incited national governments to support financial institutions through a range of rescue programmes, including state guarantees.

Through this period, the appropriateness of policy responses taken at Member State level were being weighed, as were the best courses of action for further interventions. The overall conclusion was to implement a coordinated framework based on a set of EU common principles to guide national decision-making regarding interventions.[5]

The key motivation for using state guarantees was to enhance the soundness and stability of the banking system, and, overall, to restore confidence and the proper functioning of wholesale funding markets.

However, other considerations were also taken into account in the design of state guarantees. Firstly, a distinction was made between financial institutions whose circumstances were due to general market conditions (of the nature described above) but were fundamentally sound and those institutions whose pre-existing weaknesses were exposed through the financial crisis. Specifically, state guarantees were viewed as a suitable intervention for the former group of banks but not the latter.

Secondly, there was also a preoccupation to ensure, to the extent possible, a level playing field between banks issuing state guaranteed bonds and other banks, and minimise any competition distortions that might arise from the granting of state guarantees.

Reflecting these points, state guarantees shifted from the provision of individual guarantees and moved largely towards generalised schemes. This reflected the systemic scale of the problem and the need for a system-wide solution. It also took into account the potential for fragmentation of wholesale funding markets.

Eligibility criteria codified, among other things, the requirement that only solvent banks could take up a state guarantee.

More generally, the set-up of schemes with predominantly rules-based rather than discretionary access implied that banks could evaluate whether they wished to participate in state guarantee schemes or not. It was expected that transparent and fair access would help to minimise any potential negative competition.

In addition to these specific principles relating to effectiveness, competition issues and market fragmentation, the general policy approach set out conditions specifying the circumstances in which state aid would be justified. Broadly, the criteria relate to the evaluation of whether there is a 'serious disturbance' that would have an immediate impact on the entire economy of a Member

[5] Among the key texts highlighting this process are Ecofin Council (2008) and European Commission (2008).

State in the absence of intervention. Additionally, the policy approach foresaw regular monitoring of economic conditions as any interventions should be temporary by nature and relate only to the duration of the crisis situation.

The sections below provide a more detailed overview of trends in the use of state guarantees.

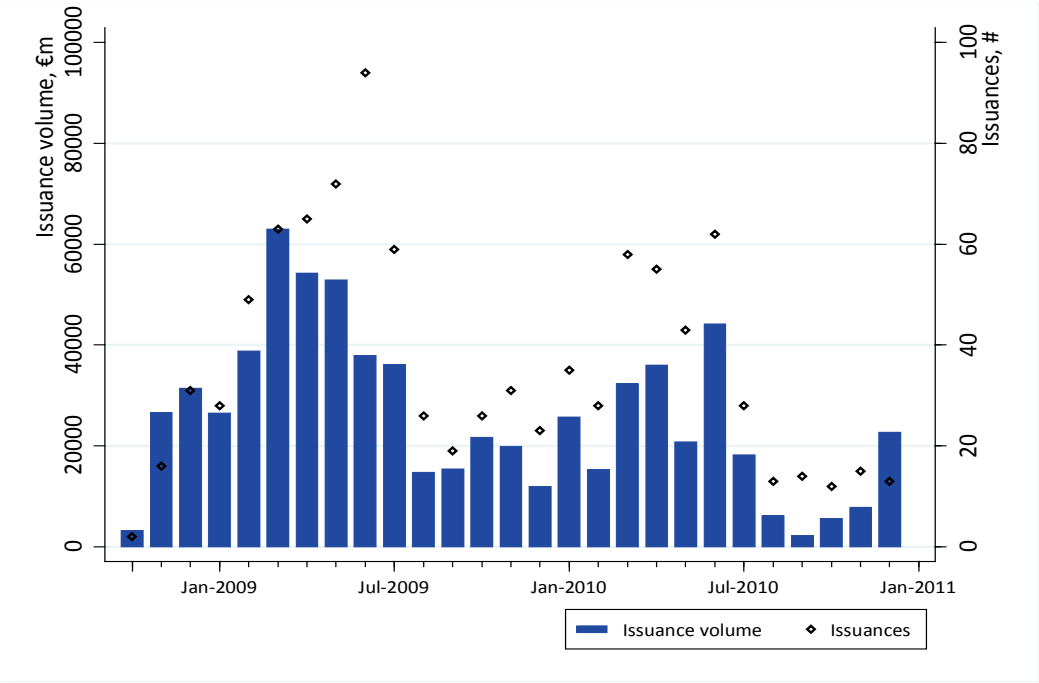
2.2 Patterns of issuance activity

2.2.1 Issuance activity over time

Between October 2008 and December 2010 close to 1,000 SG bond issues worth over €500bn were brought to market by banks with EU Member States acting as guarantors.

The pattern of issuance activity over time is shown in Figure 1 below. During the first nine full months of the period under study (Nov-2008 – Jul-2009), almost 50% of issuances took place, rising from 16 in November 2008 to a peak of 94 in June 2009. On average, over 50 SG bond issues were brought to market per month. Subsequently, the number of new SG bond issues fell to an average of slighter more than 35 per month. And finally, only a small level of issuance activity took place in the second half of 2010. The value of issuance activity over time is also shown in Figure 1. This further illustrates that the main period of issuing activity was Nov-2008 – Jul-2009, accounting for over 50% of the total value of SG bonds issued.

Figure 1: Pattern of SG bond issuance activity, number of bond issues (#) and value of bond issues (€mn), Oct-08 - Dec-10



Source: Bloomberg

Given the volume of SG bond issuance activity, one might be concerned that there may be adverse spill-over effects impacting negatively other issuance activity. Panetta et al. (2009) investigate this

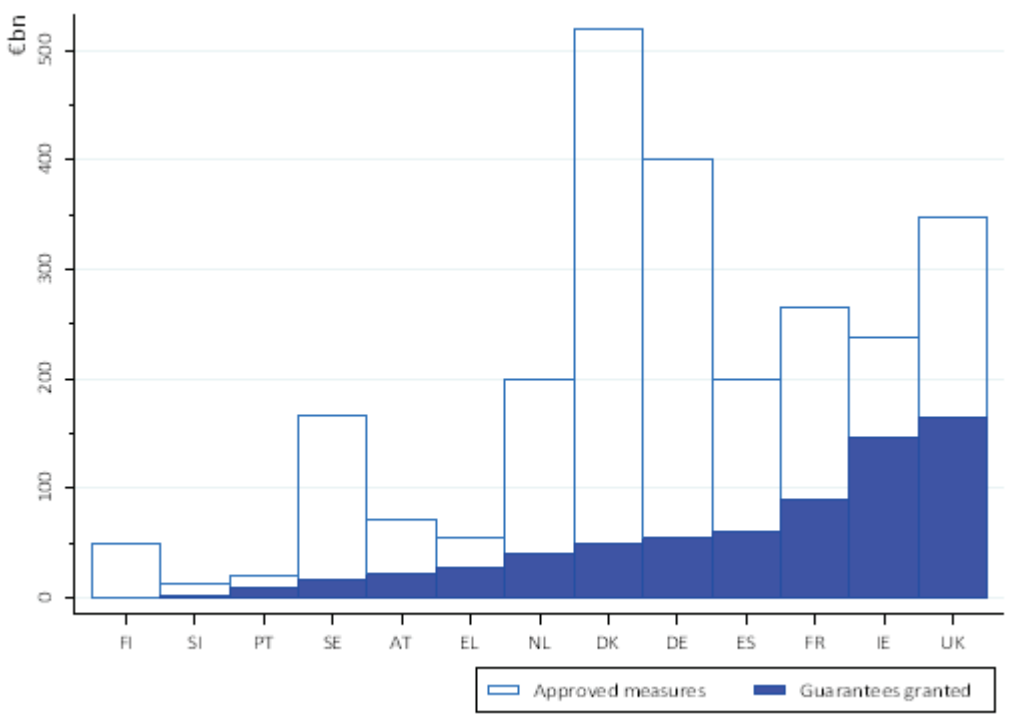
issue. They consider the relationship between SG bond issues and non-SG bonds issues and find that, even around the peak of SG bond issuance activity there is no evidence of substitution between the two classes of securities in the Euro area, with issuance in each remaining broadly in synchronicity. There is some of evidence of substitution between SG bonds and non-SG bonds in the UK though. Over January and April 2009, a strong negative association was found between SG and non-SG bonds. However, this negative link disappears the following month. Section 3.6 considers in greater detail the issue of spill-over as reflected in issuing costs faced by banks.

2.2.2 Issuance activity by Member State

Figure 2 shows the distribution of approved measures and guarantees granted under state guarantee schemes. This shows that the number and value of approved state guarantees varies greatly across the EU.

Among Old Member States, approved measures ranged from as little as €20.5bn in Portugal up to €518.7bn in Denmark. This represents 11.9% of GDP in the case of Portugal and 221.3% of GDP in the case of Denmark.

Figure 2: Approved measures and guarantees granted under state guarantee schemes



Note: Approved measures in excess of €5bn shown
Source: European Commission

These figures, especially in the case of Denmark, may seem large. However, firstly, the figures for approved measures are significantly larger than guarantees granted. The utilisation (guarantees granted as a percentage of approved measures) of state guarantees across the EU27 is 27.8%, on average.

Secondly, while this utilisation rate still represents a substantial figure of €711.9bn, national governments would have to make payouts to investors only in the event that banks cannot honour their SG bond payments to investors.

Two factors therefore made state guarantees attractive to governments. Approved measures signalled that national governments were willing to intervene in the banking sector to maintain financial stability, which may have served to restore the confidence lacking in wholesale funding markets. Further, participation in state guarantee schemes bore no immediate cost to national governments but only future cost in the event of default on SG bonds.

Table 1 provides more detailed information on the patterns of issuance activity, by Member State, including for New Member States which approved among the smallest set of state guarantees.

Interestingly, a number of ad hoc interventions also took place in Member States including Belgium, Denmark, France, Luxembourg, Portugal, Sweden, Slovenia, Slovakia and the UK. The total value of these interventions was €429.1bn or 3.5% of EU27 GDP. Many of these were also within the scope of the EU common principles set out for state guarantee (European Commission, 2008) on the basis that guaranteed banks were of systemic relevance.

That being said, a minority of ad hoc interventions were aimed at supporting more troubled institutions. Two examples are Dexia, which was jointly guaranteed by France, Belgium and Luxembourg, and Hypo Real Estate (HRE), which was guaranteed by Germany.

Indeed, Hypo Real Estate received a more complex set of interventions aimed at securing credit from a private consortium of banks and the Deutsche Bundesbank. Panetta et al. (2009) report that the package included a state guarantee of €20 billion and an additional guarantee outside the main scope of the main set of state guarantees of an HRE note of €15 billion eligible for Eurosystem refinancing. The two guarantees supplemented a secured HRE note (€15 billion) subordinated by a German financing consortium in exchange for HRE collaterals (€60 billion) that were not eligible for Eurosystem refinancing.

Table 1: State guarantees schemes and *ad hoc* guarantees by Member State, €bn and %age GDP

Member State	State guarantee schemes					*Ad hoc* interventions	
	Approved measures		Guarantees granted		Utilisation		
	€bn	%age GDP	€bn	%age GDP	%age	€bn	%age GDP
AT	70.6	24.9	21.3	25.1	30.2%	0.1	0.0
BE	0.0	0.0	26.4	68.4		240.8	68.2
BG	0.0	0.0	0.0	0.0		0.0	0.0
CY	3.0	17.2	3.0	17.2	100.0%	0.0	0.0
CZ	0.0	0.0	0.0	0.0		0.0	0.0
DE	400.0	16.0	53.9	18.6	13.5%	103.0	4.1
DK	518.7	221.3	49.0	235.9	9.4%	0.0	0.0
EE	0.0	0.0	0.0	0.0		0.0	0.0
EL	55.0	23.9	28.0	47.8	50.9%	0.0	0.0
ES	200.0	18.8	59.8	15.9	29.9%	0.0	0.0
FI	50.0	27.7	0.0	9.5	0.0%	0.0	0.0
FR	265.0	13.6	89.8	15.5	33.9%	36.5	1.9
HU	1.8	1.8	0.0	1.8	0.0%	0.0	0.0
IE	238.5	154.9	146.7	175.7	61.5%	0.0	0.0
IT	0.0	0.0	0.0	0.0		0.0	0.0
LT	0.9	3.2	0.0	6.4	0.0%	0.0	0.0
LU	0.0	0.0	1.3	11.2		4.5	10.8
LV	3.4	18.9	0.2	23.4	5.9%	0.8	4.3
MT	0.0	0.0	0.0	0.0		0.0	0.0
NL	200.0	33.8	40.8	34.1	20.4%	0.0	0.0
PL	5.0	1.4	0.0	1.3	0.0%	0.0	0.0
PT	20.5	11.9	8.4	5.6	41.0%	0.5	0.3

Table 1: State guarantees schemes and *ad hoc* guarantees by Member State, €bn and %age GDP

Member State	State guarantee schemes					*Ad hoc* interventions	
	Approved measures		Guarantees granted		Utilisation		
	€bn	%age GDP	€bn	%age GDP	%age	€bn	%age GDP
RO	0.0	0.0	0.0	0.0		0.0	0.0
SE	167.3	48.3	16.9	39.5	10.1%	2.2	6.1
SI	12.0	33.3	2.2	33.5	18.3%	59.8	5.7
SK	2.8	4.2	0.0	4.2	0.0%	16.9	4.9
UK	348.5	20.6	164.1	23.3	47.1%	164.1	9.7
TOTAL	**2,563.0**	**20.9**	**711.9**	**5.8**	**27.8%**	**429.1**	**3.5**

Source: European Commission

20

2.3 Issuance strategies

Banks adopted different types of strategies in regard to the issuance of SG and non-SG bonds. The majority of banks participating in state guarantee schemes issued only SG bonds over the period of the study (131 banks). However, a significant minority issued a mix of SG and non-SG bonds (42 banks).

In terms of timing, those issuing both types of bonds followed up SG bond issues with non-SG bond issues. Among this group, SG bond issues were followed up by non-SG bond issues, on average, five months afterwards. This provides an early indication that non-SG bond issues were facilitated by earlier SG bond issues.

In terms of size, SG bond issues tended to be substantially larger than non-SG bond issues among banks issuing both types of bonds. Issuance volumes of SG bonds by this group of banks were €0.7bn on average while issuance volumes of non-SG bonds were €0.12bn on average.

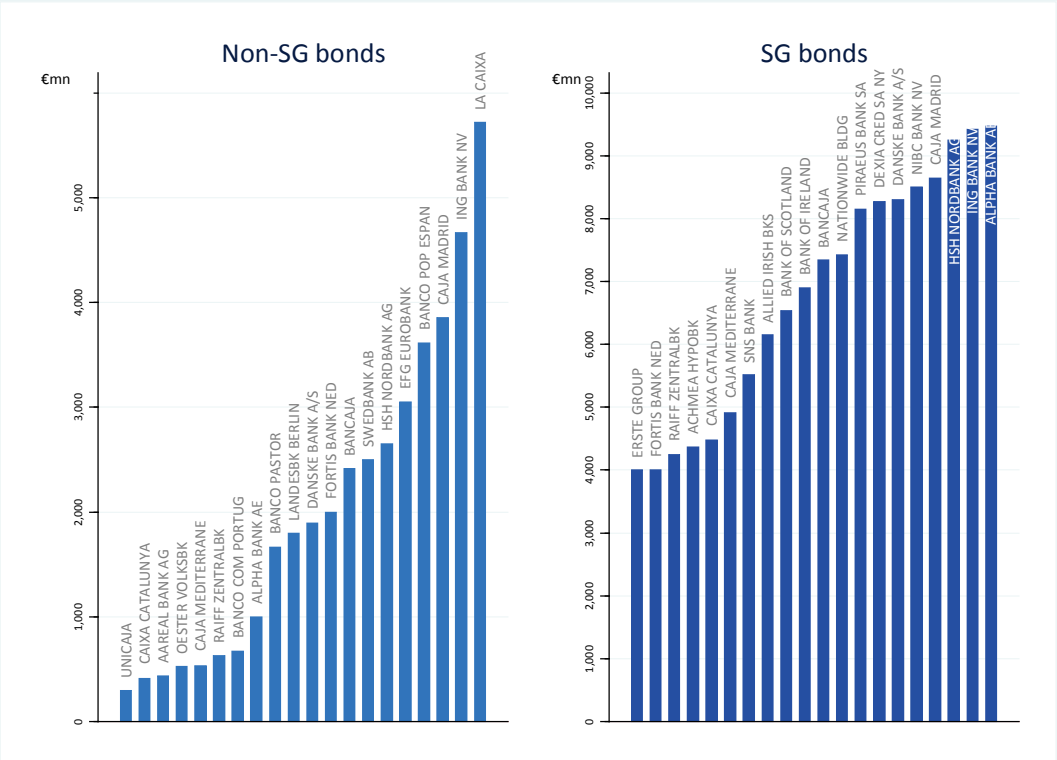
A larger number of non-SG bond issues were brought to market than SG bond issues among the group of banks issuing both types of bonds, at 291 for SG bond issues and 404 for non-SG bond issues. However, in terms of overall value, SG bond issuances still exceed non-SG issuances.

Geographically, Member States with the banks issuing the most SG bonds only are also the Member States with the banks issuing SG and non-SG bonds. This includes Member States such as Denmark, Germany, Spain and the UK.

Figure 3 shows the top 20 issuers (by issuance volume) of SG and non-SG bonds among banks whose bond issues benefitted from state guarantees. In general, the identity of the top SG issuers is different from that of the top non-SG issuers.

However, in line with some of the observations made above, a number of common names are found in both the left-hand and the right-hand panes. Danske Bank and Caja Madrid feature in both panes, consistent with the finding that Danish and Spanish banks issued a mix of SG and non-SG bonds. And, other banks such as the Allied Irish Bank, feature in the SG bonds list but not the non-SG bonds list.

Figure 3: Top 20 issuers of bonds among banks receiving state guarantees



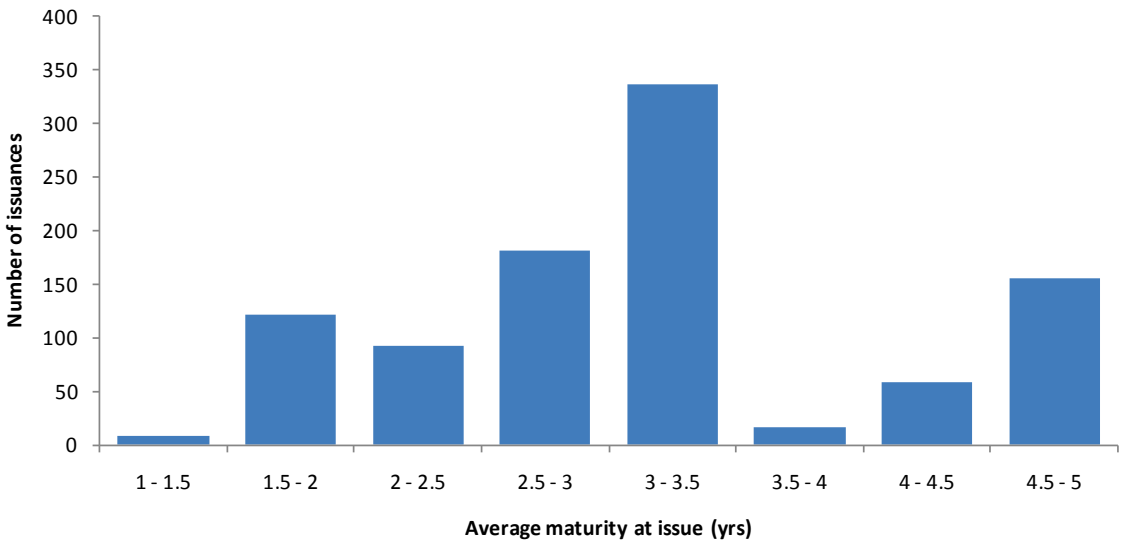
Note: Issuance volumes of greater than €10,000mn (or €10bn) omitted for presentation purposes
Source: Bloomberg

2.4 Maturity structures

State guarantee schemes focused on medium-term instruments. If stated explicitly by guarantors, the maximum tenor is either three or five years. Figure 4 describes the maturity structure of SG bonds actually issued, which shows a clear preference among banks for tenors at the top end of the permitted range. SG bonds with average maturity at issue of three and five years account for 30% and 15% of the population, respectively.

The motivation for focusing on medium-term instruments for state guarantees was to ensure that government support was time limited. In addition to restrictions on the maximum tenor for SG bonds, banks could only participate in SG schemes during a limited time window. In some Member States in which it was deemed that the impacts of the financial crisis on the banking sector had not fully alleviated, state guarantee schemes continued for longer, but in others they were discontinued. Annex 1 provides detailed information in this regard.

Figure 4: Maturity structure of SG bonds at issue by number of issues at different maturities



Source: Bloomberg

2.5 Pricing of issuances

2.5.1 Fees

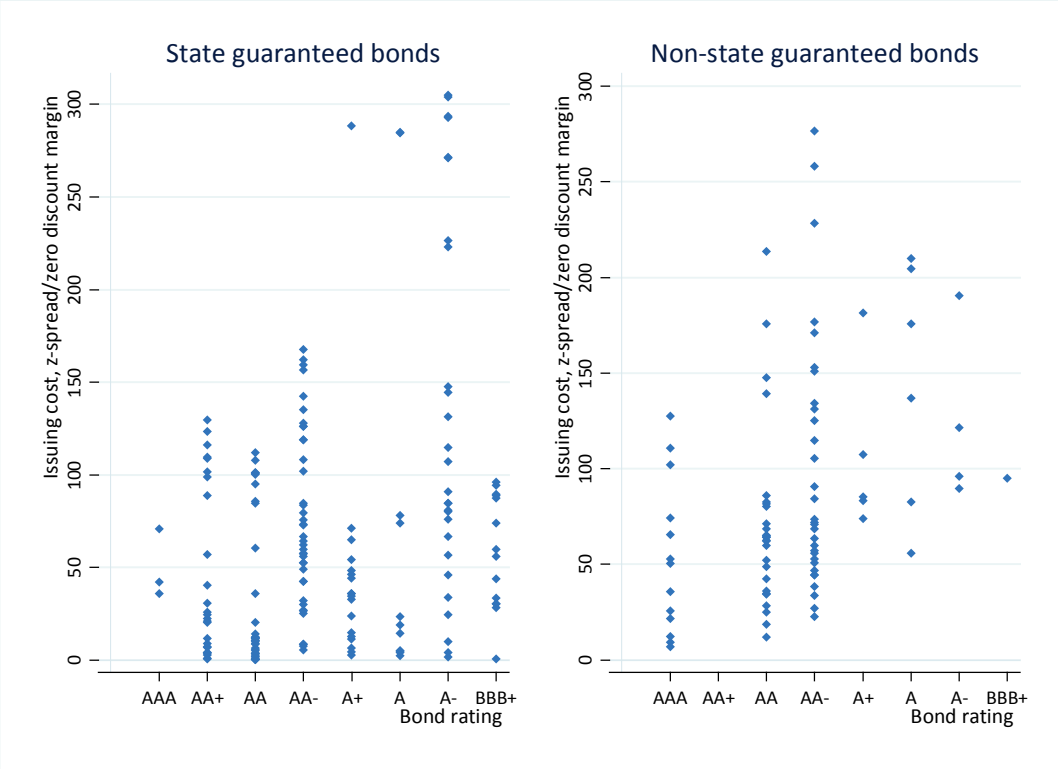
In order to access a state guarantee, banks had to pay an annual fee to the government acting as guarantor of 50 basis points (bps) plus the median five-year CDS spread of the issuing bank over the period January 2007 – August 2008, and in some cases an additional premium based on the credit rating of the issuing bank.

The inclusion of a CDS spread measure in the state guarantee fee implies a risk-based structure. The median five-year CDS spread over January 2007 – August 2008 for Fortis Bank, for example, was 91.6 bps implying that it paid 141.6 bps annually on the value of its SG bonds to its guarantors. Nordea Bank, as another example, would have had to pay only 124.3 bps on the value of SG bonds as its median five-year CDS spread over January 2007 – August 2008 was lower – at 74.3 bps. Interestingly, however, Nordea Bank chose not to issue SG bonds, suggesting that its total issuing costs were lower if it issued non-SG bonds.

2.5.2 Issuer versus sovereign credit ratings

In general, the range of issuer ratings for SG bonds was relatively large: close to 90% of banks received one of five types of 'A' rating and slightly more than 10% of banks received one of six types of 'B' rating. Despite this, banks of a wide range of creditworthiness were issuing SG bonds at relatively low issuing cost compared to non-SG bonds, as shown in Figure 5. This suggests that issuer credit ratings are relatively unimportant to the pricing of credit risk embedded within SG bonds, and investors treated SG bonds as gaining exposure to sovereign risk.

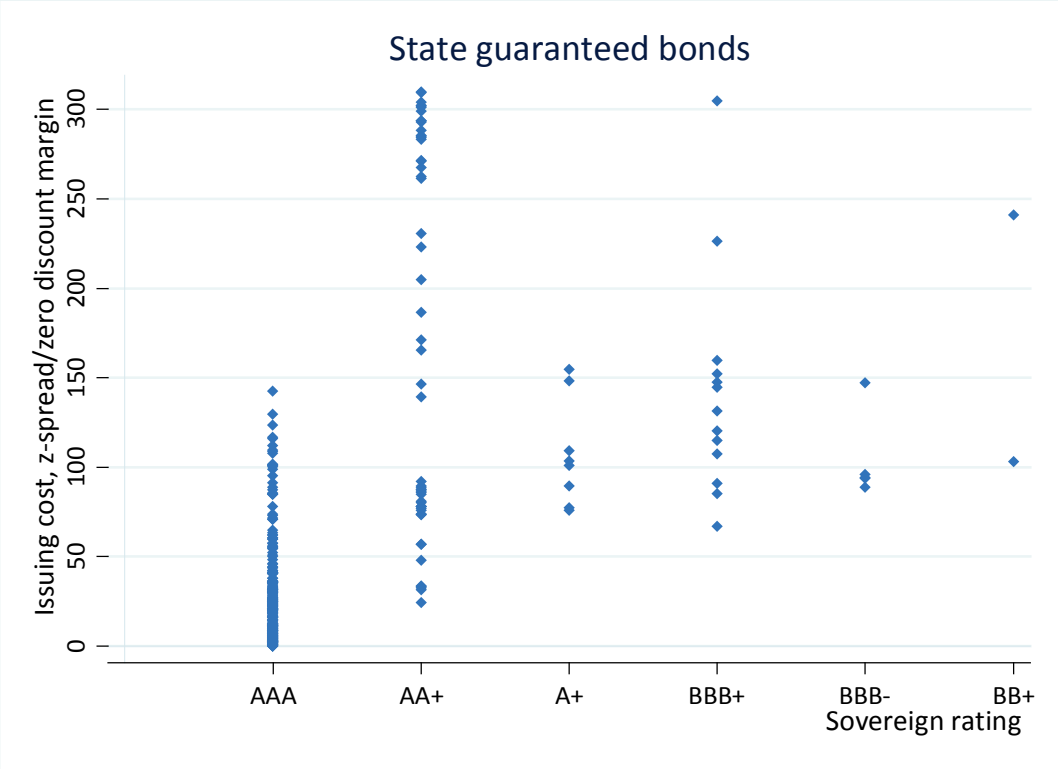
Figure 5: Issuing cost by issuer rating, SG and non-SG bonds



Source: Bloomberg and Bankscope

Figure 6 confirms this hypothesis. A large concentration of SG bonds is guaranteed by AAA-rated sovereigns and associated to this are low issuing costs. There is also some evidence of a link between sovereign ratings and issuing costs as sovereign ratings fall.

Figure 6: Issuing cost by sovereign rating, SG bonds



Source: Bloomberg and Bankscope

Given the above, investors may view the credit risk of SG bonds to be more closely correlated with sovereign credit ratings. Other studies have found that "strong" Member States may be propping up "weak" financial institutions (Levy and Schich, 2010).

2.5.3 Grace periods

Given the relative importance of sovereign credit ratings over issuer credit ratings to issuing costs, the exact terms of compensation in the event of issuer default may well be important – that is, whether procedures in the event of default are explicit and the length of time between default and payment to the investor is specified.

This information is provided in Table 2 below. Disclosure of grace periods may be expected to be related to lower issuing costs as might shorter and more tightly defined grace periods, if these factors are relevant considerations in the pricing of credit risk for investors.

Information on grace periods is more widely available for SG bonds guaranteed by the government of Austria than for most other countries, for example, with grace periods being known for close to three-quarters of issues. Grace periods for SG bonds in Denmark, as another example, are relatively short (three to seven days) and fairly tightly defined (within a range of four days) compared to other countries.

Table 2: Grace periods of SG bonds, by guarantor

Guarantor	Grace period	
	Disclosure† (%)	Timeliness (days)
AT	74	5-30
BE/FR/LU	25	14-15
DE	7	30
DK	19	3-7
EL	29	14
ES	0	NA
FR	NK	NK
IE	55	14-15
NL	63	5-30
PT	67	10-14
SE	84	15-30
SI	57	5
UK	43	7-30
Weighted average	**33**	**6.78**

Note: Averages weighted by amount issued per guarantor, † Availability of information on the grace period for missed payments afforded to issuers to bondholders, NK (not known)
Source: Bloomberg and London Economics

2.6 Summary

This section began with a general background discussion on the state guarantee schemes and the policy context. Chief considerations at the time policy was adopted included ensuring the soundness and stability in the banking system while minimising anti-competitive effects and market fragmentation.

The section then provided evidence of the actual implementation of state guarantees and made the following observations.

- Issuance activity was greatest in the first half of 2009, eased in the second half of 2009 and rose again in the first half of 2010.
- Across Member States, issuing activity was largest in the UK, Ireland and France followed by Spain, Germany, Denmark and the Netherlands.

- The majority of participating banks issued SG bonds only while a minority issued both SG bonds and non-SG bonds.

  This finding is interesting because it suggests banks were either unable to access wholesale funding markets at reasonable issuing costs or bank were substituting different forms of funding. Section 3 (on issuing cost) and Section **Error! Reference source not found.** (on funding outcomes) explores these issues further.

- Banks taking up state guarantees were issuing bonds at the top end of the permitted range for maximum tenor.

  This is pertinent in regard to the principle of providing time-limited support advocated in the design of guarantee schemes, as it appears banks were seeking to issue relatively long-dated debt through state guarantees.

- In terms of fees, banks had to pay a risk-based price for SG bonds. This provision implies access to state guarantees are based on market-based principles, i.e., pricing accounts for credit risk.

  Despite this, when considering sovereign ratings versus issuer ratings against issuing costs (captured through credit spreads), one observes that issuance costs of SG bonds tend to follow sovereign ratings more than issuer ratings. This aspect of the state guarantees schemes is reviewed in greater detail in Section 3 .

- Finally, Member States differ in regard to bond terms and conditions in the event of default. This may affect the credit risk embedded in SG bonds issued by banks in different Member States, a point that is further examined in Section 3 as well.

3 Issuing costs of state guaranteed bonds

3.1 Introduction

State guarantees were used by Member States to support banks that were solvent but illiquid to issue debt securities in the maturity spectrum 1-5 years. This was a response to diminished activity on wholesale funding markets, which involved banks being otherwise unable to access medium-term funding at reasonable cost or via alternative sources such as securitisation.

The rationale for state guarantees particularly was to tackle the problem of counterparty risk that was hampering the proper functioning of wholesale funding markets. In effect, the introduction of state guarantees was to influence interbank risk premia by transferring risk from banks' balance sheets to guarantors.

Empirically, previous studies provide mixed evidence. Jochen et al. (2009), for instance finds evidence of a statistically significant reduction in issuing costs as a result of state guarantees in the "subprime phase" of the financial crisis but not the latter "global phase" of the financial crisis in the UK. Moreover, in the Euro area, the global phase saw state guarantees associated with higher issuing costs. While Panetta et al. (2009) also find that state guarantees to banks reduced issuing costs; their evidence suggests that guarantor characteristics are major determinants of the magnitude of the impact of state guarantees on issuing costs. According to Panetta at al. (2009), the combination of a high sovereign rating, ratio of resources committed to state guarantees as a proportion of GDP and absolute resource commitment reduced issuing costs by 64bps, on average.

This chapter contributes to this evidence base on the impact of state guarantees to banks by undertaking like-for-like comparisons across bonds included and not included in state guarantee schemes having controlled for issue-specific, bank-specific and other factors. As described in our study strategy, by using a benchmark of bonds not included in state guarantee schemes we attempt to isolate the pure effect of state guarantees on issuing costs. This is a departure from the abovementioned body of work that concentrates on SG bonds only, without non-SG bonds as a reference point.

The key findings of this chapter are as follows. Issuing costs of SG bonds are, on average, 33.4bps lower than in absence of the guarantee though with a somewhat wide range of 18 bps to 57 bps.

The distribution of impacts varies more widely still. SG bonds with median issuing costs or below within our sample did not show state guarantees have a statistically significant impact on their issuing costs. Meanwhile, SG bonds with above (median) average issuing costs saw impacts range from 63.7bps to 164bps.

Moreover, we note a ratings upgrade effect insofar as state guarantees had a sizeable statistically significant impact on the issuing costs of bonds rated BBB-/BBB/BBB+, in the order of over 200bps.

However, the greater the level of SG bond issuance activity, the larger the issuing costs of any single bond. Each bond issue faced higher issuing costs of 0.04bps for each tranche of €1billion in SG bonds issued during the month. On average, this "indirect effect" amounted to raising issuing costs by 10.5bps.

Moreover, this negative impact is higher for non-SG bonds issued by banks which did not participate in the scheme (0.08 bps for each tranche of €1billion in SG bonds issued) than for bonds (SG and non-SG) issued by participating banks, for which there was no statistically significant effect.

This indirect effect is entirely domestic as the monthly volume of SG bond issues outside a Member State is not found to impact on the issuance cost of SG and non-SG bonds in the domestic market.

The remainder of this chapter is structured as follows. Section 3.2 covers data and measurement in extensive detail. Section 3.3 describes the empirical strategy followed for identifying the relevant non-SG bonds to compare to SG bonds. Section 3.4 provides a descriptive analysis of issuing costs. And, Section 3.5 provides the results of the econometric analysis.

3.2 Data and measurement

Two sources were used to collect information at the bond-level, bank-level and wholesale funding market-level:

- **Bloomberg®** provided bond- and market-level data. Bond-level data were gathered to measure bond issuing costs and their determinants. And, market-level data were collected to provide market-level information on factors influencing bank outcomes and bond issuing costs.
- **BankScope®** provided bank-level data, especially information on bank ratings, required for measuring the impact of these factors on issuing costs.

In addition to the main data sources used, information contained in various central bank, government and other reports were used to compile a database of the features of state guarantee schemes. The primary use of this database was to identify non-SG bonds that would have been eligible for a state guarantee to serve as a counterfactual or comparison group against which to compare SG bonds and their impacts on bank outcomes.

The remainder of this section considers bond data and measurement in depth in relation to issuing cost. Section 3.3 covers the identification of non-SG bonds. Annex 2 and Annex 3 provide further details of the data, including summary statistics and our treatment of missing data, respectively.

3.2.1 Issuing cost

Definition

Issuing cost is defined in this report as the return or yield banks have to offer on SG and non-SG bond issues in order for investors to be willing to take them up. Barclays Bank, for instance, issued a SG bond of $1bn offering a fixed rate coupon of 2.7% over three years in March 2009. Therefore, the issuing cost to Barclays Bank vis-à-vis investors was 2.7% or $27,000,000 per annum.

Banks also face fees, including for underwriting, legal, accounting and marketing services associated with bringing SG and non-SG bonds to market. Additionally, in the case of SG bonds, government guarantors required an annual fee from banks in exchange for a state guarantee. The

most common structure of this latter fee is to include a fixed component of 50bps plus a variable component related to bank risk (based on historical CDS spreads or credit ratings).[6]

For the purposes of this study, the term issuing cost will focus on returns or yields to SG and non-SG bonds and omit fees. Our approach is to estimate a model of issuing costs in order to determine the market value of a state guarantee in terms of issuing costs, controlling for other factors.

This choice is driven by the considerations presented below.

Omission of guarantee fees

Assessing the effectiveness of state guarantees in restoring the proper functioning of wholesale funding markets (and related policy questions) requires an understanding of how state guarantees influenced *choices* made by investors to supply funds and by banks to demand funds.

Investor decision-making is driven by returns to (or issuing costs of) SG and non-SG bonds only, hence these are considered in isolation of fees banks face, including guarantee fees.

Data on differences in returns between SG and non-SG bonds show how well SG and non-SG bonds attract investor funds. Or, put in another way, returns to SG and non-SG bonds are the relevant issuing costs because they capture the factor on which investor choices to participate or withdraw from wholesale funding markets are made. Fees charged to banks for bringing bonds to market and for guarantees, in the case of SG bonds, have no direct impact on investor decision-making.

Bank decision-making is driven by issuing costs and fees. However, these choices cannot be analysed because data on returns to SG and non-SG bonds in a counterfactual world in which state guarantee schemes are not present do not exist.

In theory, guarantee fees could have mooted the impact of state guarantees on wholesale funding markets if they discouraged credit constrained banks from taking up state guarantees and/or encouraged non-credit-constrained banks to issue SG bonds instead of non-SG bonds.

Empirically, however, these bank choices cannot be observed directly because the presence of state guarantees prevents us from uncovering what issuing costs of SG and non-SG bonds *would have been* in the absence of state guarantees.

Indirectly, the question of how effectively state guarantees encouraged credit constrained banks to take-up SG bonds and discourage non-credit-constrained banks can be observed through bank outcomes such as lending behaviour.

Both credit constrained and unconstrained banks may be willing to take-up SG bonds. However, while constrained banks could be expected to use state guarantees to expand lending activity, unconstrained banks would be more likely to use SG bonds to substitute for other sources of

[6] Section 3 describes the nature of these fees and size of actual charges made to banks.

external finance. Empirically, these differences can be observed and indicate whether credit constrained banks had selected into guarantee schemes or not.

Anecdotally, the general perception is that limited activity on wholesale funding markets reflected banks' inability to access wholesale funding at all. If this is really the case, banks were not, therefore, substituting SG bonds for non-SG bonds they could have been issuing.

Further, Acharaya and Sundaram (2009) show that guarantee fees represented a small tax rather than a subsidy to banks taking up SG bonds. This further supports the notion that banks did not have an incentive to take-up SG bonds if alternative wholesale funding options were available to them.

To summarise, empirically assessing the effectiveness of state guarantees in restoring the proper functioning of wholesale funding markets (and related policy questions) requires an understanding of how state guarantees influenced choices made by investors to supply funds and choices made by banks to demand funds. Investor decision-making is driven by returns to SG and non-SG bonds only, hence these are considered in isolation of fees banks face. Bank decision-making is driven by returns (or issuing costs) and fees. However, these cannot be analysed because data on issuing costs in the absence of state guarantee schemes is unavailable.

Credit spreads

Issuing cost is generally expressed as the difference between the returns or yield investors can expect from a given SG/non-SG bond and a comparable benchmark security/curve that is (assumed) risk free. This difference captures the additional return investors must be paid in order to compensate them for assuming the additional credit risk embedded within an SG/non-SG bond and is known as the credit spread.

From a policy perspective, credit spreads provide a highly valuable measure of issuing cost. This is because they also summarise market perceptions of the credit risk of banks, which is fundamental to understanding the role state guarantees played in stimulating activity on wholesale funding markets.

Practically, credit spreads allow for the relative value of SG and non-SG bonds to be compared within and across banks through a single statistic.

The spread to Treasury at issue, for instance, on the $1bn SG bond issued by Barclays Bank in March 2009, for instance, was 149bps (or 1.49%), implying that investors as a group required an additional $14,900,000 per annum compared to what they would require in order to invest in a comparable Treasury security on the day of issue. Meanwhile, the spread to Treasury at issue on the $1bn SG bond issued by Swedbank was 119.3bps, implying that the difference in credit risk between the two SG bonds amounted to 29.7bps (149bps – 119.3bps) or $2,970,000 per annum.

Further, credit spreads summarise a range of factors that influence credit risk, which can be isolated empirically to consider policy questions such as the impact of state guarantees on issuing cost. Continuing with the examples of the Barclays Bank and Swedbank bond issues described above, several comments regarding the sources of differences in credit risk can be made. For example, firstly, the Swedbank SG bond was issued in Jun 2009 when wholesale funding markets were, at least to some degree, different to March 2009. Secondly, the maximum tenor was four

years whereas it was three years in the case of the Barclays Bank SG bond issue. Thirdly, the state guarantor for the Swedbank SG bond issue was the government of Sweden and for the Barclays Bank SG bond issue was the UK government, whose sovereign risk may be valued differently. These factors and a number of additional factors are discussed in section 3.2.2.

Measurement

As mentioned above, the key benefit of using a credit spread to measure issuing cost is that it allows for the relative value of different securities to be compared within and across banks through a single statistic.

In practical terms defining such a credit spread is challenging. There are trade-offs to consider, particularly in the choice of a comparable benchmark. And, due to choices made in relation to these trade-offs, there are a range of credit spread measures available, as described below.[7]

Yield spread

The price of a bond, A, is equal to the present value of its payments (coupon plus principal) as described by the equation below. The discount rate, y_d, which balances the equation below, is its yield-to-maturity.

$$P^{full} = \frac{C_d / f_d}{(1+y_d)^{f_d T_1}} + \frac{C_d / f_d}{(1+y_d)^{f_d T_2}} + \ldots + \frac{C_d / f_d}{(1+y_d)^{f_d T_N}} \quad (1)$$

P^{full} is full (including accrued) price of the bond, C_d is the annualised coupon, f_d is the coupon frequency, y_d is the yield-to-maturity and $T_1,\ldots,T_N$ is the time of each of the cashflow payments in years.

The difference between the yield-to-maturity of the bond and the yield-to-maturity of the chosen benchmark bond is known as the yield spread. The yield spread is applicable to fixed rate bonds and the discount margin is the analogue measure that is applicable to floating rate bonds.

There are several problems with the yield spread. Firstly, the benchmark bond may not have the same maturity as bond A (maturity mismatch). In the case where the benchmark bond matures after bond A, the yield spread is normally likely to be underestimated. This is because the (relatively) long-dated benchmark bond contains more liquidity risk than the (relatively) short-dated bond A.

Secondly, the yield-to-maturity calculation assumes that interim payments in the form of coupons can be reinvested at the same rate as the yield-to-maturity.[8] In most cases, this is likely to lead to an overestimate of the yield-to-maturity because the credit quality of the issuing bank is likely to change over time and returns on reinvestment may be closer to/further away from the benchmark bond, at least for short periods of time.

[7] See O' Kane and Sen (2004) for further details.

[8] See Kelleher and MacCormack (2004) for an excellent discussion of the issues of yield-to-maturity (or internal rate of return) calculations.

Thirdly, the yield-to-maturity calculation assumes reinvestment at rate, y_d, for all maturities. This assumes a flat benchmark curve, which generally does not reflect market conditions.

Interpolated spread

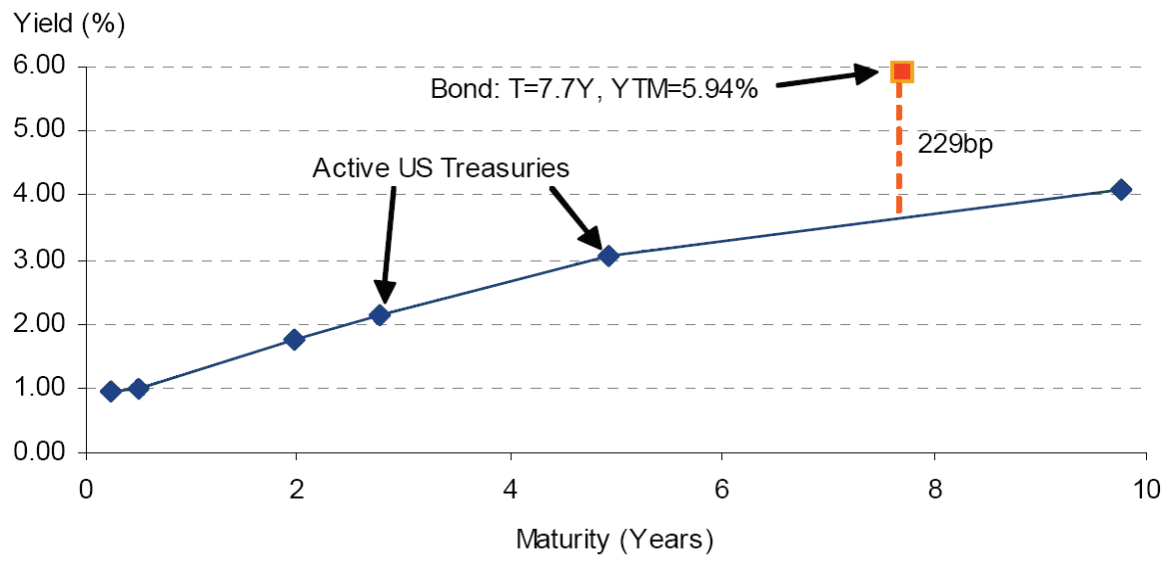
The interpolated spread (I-spread) is the difference between the yield-to-maturity of bond A and the linearly interpolated yield-to-maturity on an appropriate benchmark curve.

This can be observed visually in Figure 7 in which Bond A matures in 7.7 years and has a yield-to-maturity of 5.94%, and is represented by an orange box. The benchmark curve, represented by a blue line, is based on linear interpolation – i.e., a straight line – between active US Treasuries. The difference in yield-to-maturity between the benchmark curve (at 7.7 years) and bond A is 229bps. This is the I-spread.

The advantage of the I-spread over the yield spread is that it overcomes the maturity mismatch. Whereas the yield spread would have used the yield-to-maturity difference between bond A and, say, the 5-year or 10-year US Treasury, the I-spread uses the appropriate point on this US Treasury curve.

However, as it is also based on yield-to-maturity, the I-spread suffers from the other problems of the yield spread outlined above.

Figure 7: Interpolated spread

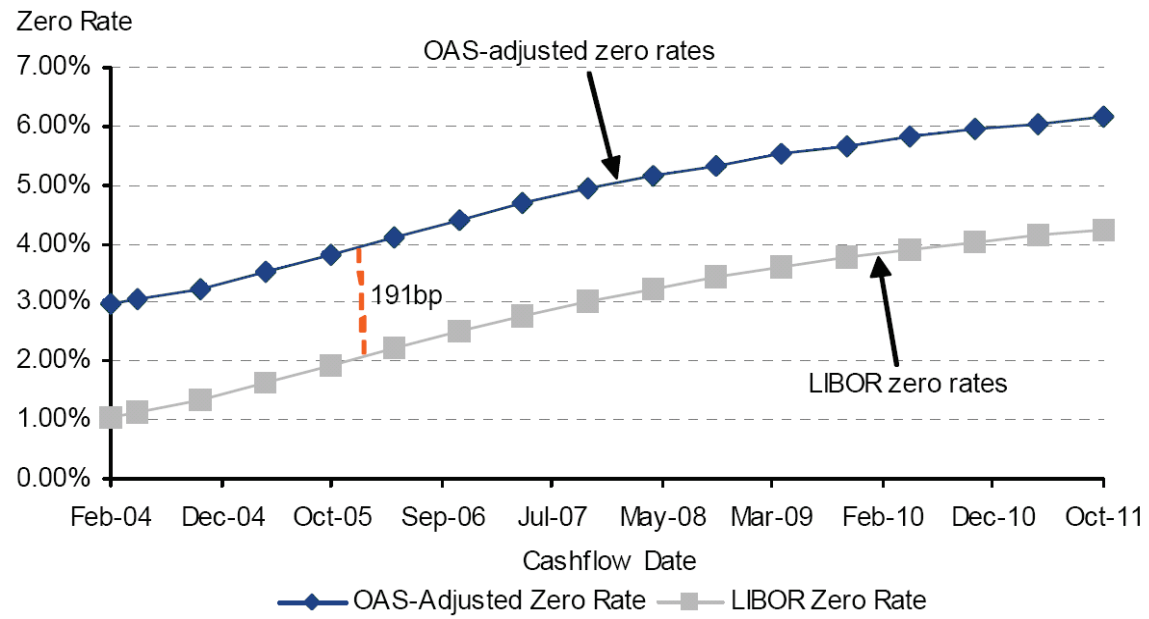


Source: O' Kane and Sen (2004)

Option-adjusted spread

The option-adjusted spread (Z-spread) involves a parallel shift of the benchmark curve required in order to meet the yield-to-maturity of the credit risky bond, A. This is illustrated in Figure 8, in which the LIBOR zero rates form the benchmark curve.

Figure 8:Option-adjusted spread



Source: O' Kane and Sen (2004)

The substantive difference between the Z-spread and the yield and interpolated spread is that the calculation factors in the benchmark curve more fully. The Z-spread is given by the equations below.

$$P^{full} = \frac{C}{f}\sum \frac{1}{(1+\frac{(r_{T(j)}+\Omega)}{f})^{fxT(j)}} + \frac{100}{(1+\frac{(r_{T(N)}+\Omega)}{f})^{fxT(N)}} \qquad (2)$$

C is the annual coupon of the bond, f is a discrete compounding frequency for the benchmark curve and benchmark yields, r_T, are related to discount factors Z_T based on equation

$$r_T = [(Z_T)^{-1/(fxT)} - 1]xf \qquad (3)$$

The key difference between equation 2 and 3 and equation 1 is the term r_T, which takes into account all the relevant points on the benchmark curve, indicated by blue diamonds in Figure 8.

Given the above, the Z-spread does not suffer from the problems of reinvestment risk that the yield-to-maturity calculation does. Moreover, the maturity mismatch issue does not arise. And finally, as a result of being based on the benchmark curve rather than a particular bond or interpolated point on the curve, the Z-spread takes into account market expectations through the term structure of interest rates.

Summary

This section provides an overview of credit spread measures, including a summary definition and an outline of the issues associated with each measure. The main measure chosen for the empirical

analysis in the present study is the Z-spread for the reasons outlined above. However, the other measures will be used to test for the robustness of the empirical results.

Table 3: Credit spread measures

Spread measure	Bloomberg code	Summary	Issues
Yield spread	yas_ytm_mid	Difference between yield-to-maturity of the bond and yield-to-maturity of a benchmark with similar but not necessarily identical maturity.	**Yield-to-maturity assumptions**: Assumes reinvestment at same rate as the yield, and assumes the bond is held to maturity. Hence, reinvestment risk unaccounted for. **Maturity mismatch**: Can be biased as maturities may not be the same and the benchmark bond changes over time. **Account of term structure of interest rates**: No
Interpolated spread (I-spread)	blp_i_sprd_mid	Difference between yield-to-maturity of the bond and yield-to-maturity of a benchmark with the same maturity.	**Yield-to-maturity assumptions**: Reinvestment risk unaccounted for, as above. **Maturity mismatch**: Benchmark rates are linearly interpolated. Gets around the maturity mismatch problem of yield spread. **Account of term structure of interest rates**: Roughly
Option-adjusted spread (Z-spread)	blp_z_sprd_mid	Parallel shift of the benchmark required in order to meet the yield-to-maturity of the credit risky bond.	**Yield-to-maturity assumptions**: Assumes reinvestment at benchmark plus z-spread so future expectations of interest rates accounted for, reducing reinvestment risk. **Maturity mismatch**: Parallel shift of benchmark overcomes maturity mismatch problem. **Account of term structure of interest rates**: Yes

Source: O' Kane and Sen (2004)

Pricing sources

There are two Bloomberg sources for the benchmark curve. Bloomberg Generic (BGN), which is based on a consensus of prices provided by brokers/dealers; and the Composite Bloomberg Bond Trade (CBBT), which derives a composite of executed prices only.

Our preferred pricing source is CBBT. This is because CBBT relies on real trade data only while BGN does not.

However, as data on all executed trades are not readily available, BGN serves as a complementary pricing source, insofar as it is based on a wider range of brokers/dealers than CBBT. For this reason, BGN will be used for a robustness check of the main results based on CBBT.

Trade Reporting and Compliance Engine (TRACE) information was also considered for use in the study but this was infeasible due to lack of data availability.

Exchange rate premia

SG and non-SG bonds considered in this study are denominated primarily in Euros. However, a fair number of bonds are denominated in US Dollars, and a small but not inconsequential minority of bonds is denominated in other currencies such as Pound Sterling, Swedish Krona, Danish Krone and other currencies.

The choice of bond currency denomination is driven by exchange rate risk considerations, which are reflected as premia (or discounts) to issuing costs. To reflect this, issuing costs are adjusted to reflect Euro-domestic currency basis swap spreads, which are market-based measure of exchange rate premia. This adjustment allows for better comparisons of bonds denominated in different currencies.

Primary versus secondary market spreads

Primary market issuing cost measures are preferred to secondary market measures because they more closely reflect issuing cost, discounting non-fundamental, secondary market factors. In particular, bonds tend to be thinly traded further away from their issue dates, and therefore, credit spreads are likely to reflect a degree of liquidity risk and other factors in addition to the fundamentals of the bond issues.

Using primary spreads means collecting data on bonds at different points in time. This means, for instance, we may observe different spreads for otherwise equivalent bonds due to different bond market conditions at the times each was issued. To account for this time-variation, we include a number of controls in our model of issuing costs, including time dummies and an index of market sentiment, which are described in more detail in the section below.

Conclusion

For the purposes of this study, credit spreads are used as a measure of issuing cost.

We showed how issuing costs as returns to investors are the appropriate variable of interest, exclusive of guarantee fees and other fees.

We then illustrated that credit spreads are useful in terms of capturing market expectations of bank credit risk in a single statistic. Furthermore, policy questions can be addressed empirically through isolating the impact of drivers of credit spreads (especially, the impact of state guarantees on issuing cost).

Different measures of credit spreads were then considered and we settled on Z-spreads as the preferred measure for the empirical analysis.

Pricing sources and the use of the CBBT as the main pricing source for the benchmark curve was then discussed, followed by our approach for accounting for exchange rate premia in our measure of issuing cost.

Finally, we covered our preference for and use of primary issuing cost data.

3.2.2 Determinants of issuing cost

Policy variables

The policy variables are the main variables of interest. The use of a state guarantee, $GUARANTEE_i$, indicates whether a bond is state guaranteed or not. All else equal, an SG bond is expected to be associated with lower credit risk and a lower issuing cost than a non-SG bond because the SG bond guarantees payments to investors in the event of default by the issuing bank whereas the non-SG bond does not.

The other policy variables -- the notional value committed by a guarantor in a given Member State ($NCOMMIT_k$), the actual value committed by a guarantor on a given Member State ($ACOMMIT_k$) and the timeliness of payments in case of default ($TIMELY_k$) -- are interacted in the empirical model with $GUARANTEE_i$ to understand whether there is an incremental impact of these aspects of state guarantees on issuing cost.

A priori, in the case of the size of notional and actual commitments to state guarantees made by Member States, for instance it is unclear, a priori, as to whether these are beneficial or detrimental to issuing cost.

- On the one hand, a larger commitment may signal lower sovereign risk associated with any single SG bond, thereby lower credit risk and issuing cost.
- On the other hand, a larger commitment may signal greater instability in the sector as a whole to investors and therefore greater credit risk and higher issuing cost.

In the case of the timeliness of payments, it is expected that more timely payments would be associated with lower credit risk and issuing costs. However, a priori, it is unclear how valuable more timely or less timely payments (in the order of days) are to investors.

Default and maturity risk

Default and maturity risk factors, covering bond-, bank- and guarantor-specific variables, are key determinants of credit risk and issuing cost.

The theoretical link between these factors and issuing cost is relatively straightforward compared to policy variables.

The rating of credit risk of securities, $RATING_i$, and institutions, $RATING_j$, are indicator variables set to 1 if the issue/issuer has a rating of AAA or 0 otherwise. An AAA rating is likely to be associated to a lower issuing cost, all else equal. As an additional check, the rating of credit risk will be measured by a categorical variable/vector of indicators for different ratings (AAA, AA, etc.).

The time to maturity at issue of a security is given by the term, $MATURITY_i$. The longer the time to maturity the greater the level of credit risk due to uncertainty of payments in the future.

The sovereign credit default swap rate, SOV_i, captures the likelihood and impact of a sovereign credit event. A higher sovereign CDS, therefore, is associated with a higher issuing cost for SG bonds, and may also affect non-SG bonds if the country of risk of the non-SG bond is the same country in which the sovereign CDS is higher.

Liquidity and interest rate risk

$LIQUID_i$, captures the liquidity risk of a security. Liquidity risk is lower among securities that can be traded more quickly and easily than other securities because these attributes reduce the likelihood of incurring losses or failing to realise profits. Liquidity risk is proxied by issuance volume in that larger issues may be more widely held and traded than smaller issues.

$FIXED_i$, captures interest rate risk associated with fixed versus floating rate bonds. If a bond provides fixed interest rate payments the variable is set to 1 and if it provides variable interest rate payments it is set to 0. As floating rate bonds are associated with a more uncertain stream of payments, credit risk and issuing costs are likely to be higher for floating rate bonds, all else equal.

Bond clauses

The expected sign of the impact of other bond terms and conditions, such as the presence of a cross-default clause, a negative pledge clause and a force majeure clause on issuing cost are as follows.

A cross default clause puts the issuing bank in default if it defaults on another loan obligation. This provides more security to investors and is therefore associated with lower credit risk and a lower issuing cost.

A negative pledge clause indicates that the issuer will not pledge any of its assets if doing so provides the investor less security. It is therefore associated with lower credit risk and a lower issuing cost.

And, a force majeure clause removes liability on the part of the issuer in the case of unavoidable events and is therefore associated with higher credit risk and a higher issuing cost.

Primary market efficiency

Primary market efficiency is proxied by the variable PRIVATEi, which indicates whether the SG/non-SG bond is privately or publicly placed. A private placement is a non-underwritten, unregistered bond sold directly to a single investor or a small group of investors. A priori, it is unclear as to whether a private placement is associated with a lower issuing cost. A private placement may be associated with a lower issuing cost if private investor(s) believe credit risk to be lower than public investors. An alternative hypothesis is that private investor(s) may be more active, bringing about a lower level of credit risk and issuing cost than public investors. On the other hand, the management of the issuing bank may be able to place the issue with private investors with whom it had a long relationship, resulting possibly in laxer monitoring and higher credit risk than would have been the case if public investors had taken up the bond issue.

Systematic characteristics

Finally, systematic characteristics may influence issuing cost.

The currency denomination of the issue, USDi/EURi, may increase issuing cost if the currency is viewed to be more risky. The market conditions at the time of issue, Ti, are likely to be associated with a higher issuing cost if they were poorer.

And, the more volatile the market place at the time of issue, VOLi, the higher the issuing cost. Volatility is captured by the VSTOXX index that provides a key measure of market expectations of near-term up to long-term volatility based on the volatility of the EURO STOXX 50 options prices. The index covers Austria, Belgium, Finland, France, Germany, Greece, Ireland, Italy, Luxembourg, the Netherlands, Portugal and Spain.

Table 4: Determinants of bond issuing cost used in the empirical analysis		
Group	**Variable(s)**	**Description**
Policy variables		
Use of guarantee	$GUARANTEE_i$	Use of guarantee indicator variable set at 1 if bond issue is covered by a state guarantee and 0 otherwise.
Notional commitment	$NCOMMIT_k$	*Notional* value committed by guarantor in a given Member State.*
Actual commitment	$ACOMMIT_k$	*Actual* value committed by guarantor in a given Member State.*
Timeliness of payments in case of default	$TIMELY_k$	Timeliness of payments in case of default in days by guarantor in a given member State.* The more timely payments are the lower is the impact of credit risk. Therefore, more timely payments should be associated with a lower issuing cost.
Default and maturity risk		
Issuer rating	$RATING_j$	Issuer rating indicator variable set at 1 if issuing bank is rated AAA and 0 otherwise. A higher issuer rating (and therefore, lower default risk) should be associated with a lower issuing cost.
Bond rating	$RATING_i$	Bond rating indicator variable set at 1 if bond issue is rated AAA and 0 otherwise. A higher bond rating (and lower default risk) should be associated with a lower issuing cost.
Time to maturity at issue	$MATURITY_i$	Time to maturity at issue in years of the bond issue. A bond issue with a longer time to maturity should be associated with higher maturity risk and therefore a higher issuing cost.
Sovereign CDS	SOV_i	Sovereign credit default swap rate, which captures compensation for expected loss due to a sovereign credit event. In the case of SG bonds particularly, a lower value should imply a lower issuing cost.
Liquidity and interest rate risk		
Issuance volume	$LIQUID_i$	Amount issued in Euros. The larger the amount issued the more heavily traded it is likely to be and the less investors should be exposed to liquidity risk. A larger amount issued is therefore associated with a lower issuing cost.
Interest rate type	$FIXED_i$	Interest rate type indicator variable set to 1 if the interest rate type if fixed and 0 if the interest rate type is floating. A bond issue with a fixed interest rate should be associated with a lower issuing cost due to the certainty of the value of payments it provides investors relative to a floating interest rate bond issue.
Bond clauses		
Cross default clause	$CROSS_i$	Cross default clause indicator variable set to 1 if the terms of a bond issue contain a cross default clause and 0 otherwise. A cross default clause puts the issuing bank in default if it defaults on another loan obligation. This provides more security to investors and is therefore associated with lower credit risk and a lower issuing cost.

Table 4: Determinants of bond issuing cost used in the empirical analysis

Group	Variable(s)	Description
Negative pledge clause	$NEGATIVE_i$	Negative pledge clause indicator variable set to 1 if the terms of a bond issue contain a negative pledge clause and 0 otherwise. This indicates that the issuer will not pledge any of its assets if doing so provides the investor less security. It is therefore associated with lower credit risk and a lower issuing cost.
Force majeure clause	$FORCE_i$	Force majeure clause indicator variable set to 1 if the terms of a bond issue contain a force majeure clause and 0 otherwise. It removes liability on the part of the issuer in the case of unavoidable events and is therefore associated with higher credit risk and a higher issuing cost.
Primary market efficiency		
Private placement	$PRIVATE_i$	Private placement indicator variable set to 1 if a bond issue was privately placed and 0 otherwise. A private placement is a non-underwritten, unregistered bond sold directly to a single investor or a small group of investors.
Systematic characteristics		
Currency	USD_i/EUR_i	Currency denomination of the bond issue set to 1 if the bond is USD- or EUR-denominated in the case of the USD_i/EUR_i variable, respectively and 0 otherwise. These variables capture currency-specific factors that may influence issuing cost.
Month of issue	T_i	Month of issue indicators (one indicator for each month of the dataset bar one) with the relevant indicator set to 1 if the bond was issued in a given month and 0 otherwise. These indicators capture time-specific market conditions that may influence issuing cost.
Volatility	VOL_i	Volatility captured by the VSTOXX Index that measures market expectations of near-term up to long-term volatility based on the EURO STOXX 50 options prices. The greater the level of volatility the higher the issuing cost of bonds.

Note: *These policy variables are interacted with the use of guarantee variable to determine whether they influence issuing cost

3.3 Empirical research strategy

The empirical research strategy adopted for assessing the impact of the state guarantees on the issuing costs of state guaranteed bonds is the counterfactual approach whereby a relevant control group of non-SG bonds is used for comparison with SG bonds.

The *average impact* of a state guarantee on issuing cost is estimated by computing the difference in issuing costs of SG and non-SG bonds, taking into account all the factors determining issuing costs that are observed and measured.

Note that the average impact does not provide a measure of the value of a state guarantee to particular banks or bond issues because these differences are controlled for through the inclusion of other determinants of issuing cost. For instance, it may be of interest to know the value of a state guarantee to banks that could not access wholesale funding markets at all. However, this factor cannot be measured because information on the issuing costs that these banks would have faced in the absence of state guarantees is not available.

3.3.1 Selection of non-SG bonds

The main requirement of the counterfactual approach is that non-SG bonds used in comparison with the SG bonds should themselves have been eligible for a state guarantee. This is to alleviate concerns about unobservable differences that may exist between the two groups that could bias findings regarding the relationship between SG bonds and issuing costs.

The intuition behind this requirement is as follows. If, for instance, non-SG bonds are issued by banks that are more likely to face insolvency risk (but this cannot be observed), then the issuing cost of their non-SG bond issues is likely to be relatively high. If these issuing costs are then compared with that of SG bonds, the difference is likely to be overestimated and some of this difference may be accredited to the impact of state guarantees. However, the difference would not be due to state guarantees but due to the relative high insolvency risk of banks issuing non-SG bonds.

For banks to issue SG bonds they have to meet bank-related and bond-related eligibility criteria among other things. Therefore, by selecting non-SG bonds that would have been eligible for a state guarantee for the counterfactual, it is more likely that they are similar to SG bonds, and also more likely that comparisons between the two groups are valid. Or, put in another way, it is more likely that estimates of the impact of SG bonds on issuing cost relative to non-SG bonds controlling for observable factors are unbiased.

Central bank, government and legal reports were analysed in order to identify banks and non-SG bonds that would have been eligible for SG schemes. Table 5 provides a summary of the findings of this analysis and Annex 1 provides a detailed description of this research.

Table 5: Summary of state guarantee schemes, by guarantor

Guarantor	Implementation date of scheme	Issue-by date	Eligible institutions*	Eligible instruments		Scale of scheme	Fee
				Currency	Maximum tenor		
AT	Dec-08	Dec-10*	DB,FB	All major	5 yrs	€70.6bn	Varies with credit rating: 70, 100, 150 bp
DE	Oct-08	Dec-09	DB, FB	DC, FC	5 yrs	€400bn	% of borrowing amount + risk premium
DK	Oct-08	Dec-10*	DB, FB		3 yrs	DKK 600bn	See annex
ES	Dec-08	Jun-11*	DB, FB	DC, FC	3 yrs*	€200bn	If <1yr 50bp; if >1yr 50bp + historic CDS spread
EL	Nov-08	Dec-10*	DB, FB	DC, FC	3 yrs	€55bn*	If <1yr 50bps*; if >1 50bps* plus fee based on CDS spread
FR	Oct-08	Dec-09	DB, FB	DC, FC	5 yrs	€301.5bn	Base cost + borrowing bank's risk level
IE	Sep-08	Sep-10	DB	All major	5 yrs	€238.5bn	See annex
NL	Oct-08	Dec-10*	DB, FB	DC, FC	5 yrs	€200bn	See annex
PT	Oct-08	Dec-09	DB, FB	DC	3 yrs*	€20.5bn	If <1yr 50bp; if >1yr 50bp + historic CDS spread
SE	Oct-08	Apr-10*	DB, FB	All major	5 yrs	€167.3bn	If <1yr 50bp; if >1yr 50bp + historic CDS spread
SI	Dec-08	Jun-10*	DB, FB	All	5 yrs	€12bn	If <1yr 50bp; if >1yr 50bp + historic CDS spread
UK	Oct-08	Dec-09	DB, FB	All major	3 yrs	£391.5bn	50bp + historic CDS spread*

Notes: Eligible institutions: DB= domestic banks/credit institutions; FB= subsidiaries/branches of foreign banks. In some countries institutions other than banks were eligible for the scheme (e.g. insurance companies, pension funds and money market funds). Currency: DC = domestic currency; FC = foreign currency.
*Additional details provided in Annex 1
Ad hoc guarantees to banks by BE/LU/FR and BE/LU/NL described in Annex 1
Source: London Economics

The implementation date of state guarantee schemes was similar across Member States, ranging from September to December 2008. In general, state guarantees to banks were issued within one or two years of the implementation date of the scheme.

Eligible institutions were predominantly domestic banks or foreign banks that conducted significant banking activities in the Member State concerned. In some cases, the decision as to whether a bank was eligible or ineligible was based on a rule. In Spain, for instance, banks had to account for at least 1/1000th of the domestic credit market. In other cases, eligible institutions were determined through the use of discretionary criteria. Notably, in Ireland, a fixed list of banks was eligible to issue SG bonds.

Other criteria, such as the currency of SG bonds, the maximum tenor (or time to maturity at issue) and guarantee fees tended to be consistent across Member States. All major currency-denominated bonds (e.g. Euro and US dollar, among others) were eligible. The maximum tenor for bonds was either three or five years. And, guarantee fees consisted of a fixed and variable component based on the bank's creditworthiness (generally, in terms of its credit rating, CDS spread).

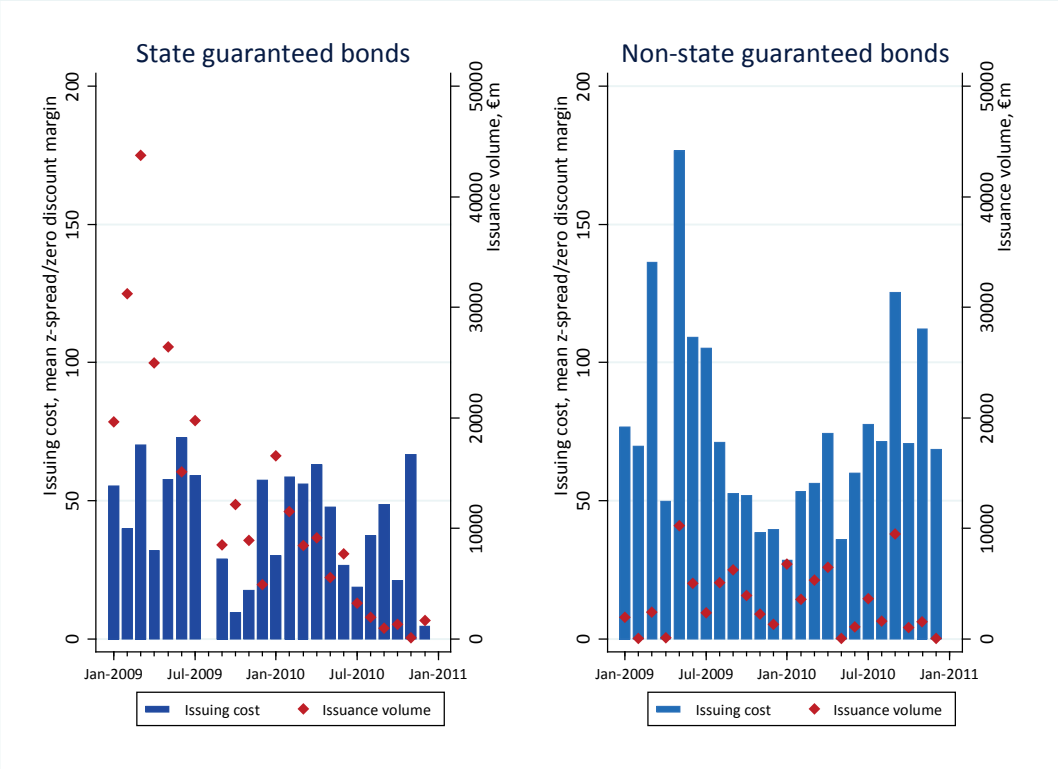
Interestingly, the criteria outlined in Table 5 changed over time, with, for instance, certain Member States expanding the scale of their schemes in proportion to the depth of the economic crisis. In practical terms, the selection criteria on which the control group of banks and non-SG bonds were based were therefore adjusted over time to reflect evolving market conditions

3.4 Issuing cost patterns

This section describes the evolution of issuing costs and provides some information on data patterns that are explored more formally in the following sections.

Figure 9 shows the evolution of issuing costs and issuance volumes of state guaranteed and non-state guaranteed bonds over 2009-2010. Issuing costs are represented by the bars while issuance volumes are represented by the hollow diamond symbols.

Figure 9: Bond issuing costs and volumes, 2009-2010



Note: Issuing costs are measured by the z-spread (for fixed rate bonds) and the zero discount margin (for non-fixed rate bonds) based on the CBBT pricing source.
Bonds with extreme issuing costs of less than zero and more than the 95th percentile were dropped from mean issuing cost calculations as they most likely reflected bond characteristics outside the scope of the analysis and reporting errors.
Source: Bloomberg

The standout feature of Figure 9 is that issuing costs are substantially lower for SG bonds than for non-SG bonds, with average z-spreads of 38bps and 82bps over the period, respectively.

The high level of issuing costs of non-SG bonds, especially in earlier months, reflects the lack of issuing activity on wholesale funding markets at the time. Over the first three months of the period, only €1.5bn of non-SG bonds were issued per month while, in contrast, €394.6bn of SG bonds were issued.

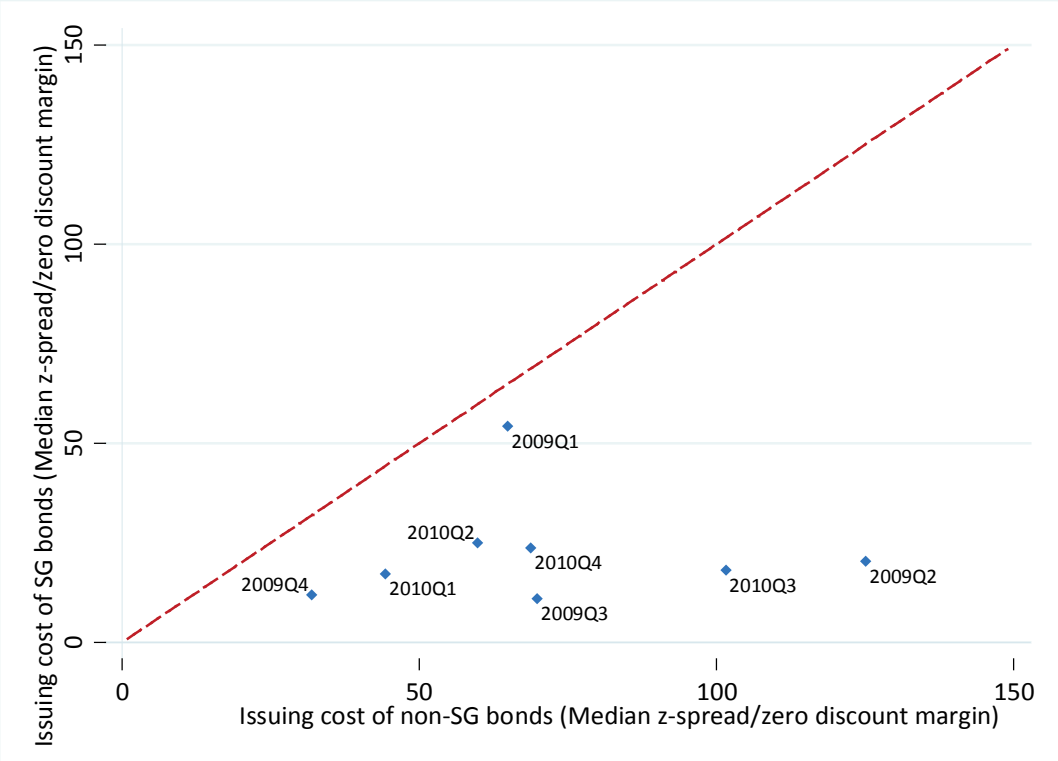
The combination of low issuing costs of SG bonds and high issuance volumes suggests that state guarantees played a significant role in wholesale funding markets at that time.

Another interesting point to note is that the pattern of issuance costs very much follows the pattern of issuance volumes for non-SG bonds but not for SG bonds. In the case of non-SG bonds, the pattern can be observed by following the month-on-month rise and fall of the bars representing issuing costs and associated rise and fall of the hollow diamonds representing issuance volumes. This pattern cannot be seen for SG bonds. Corroborating these observations, we

note that the correlation between issuing costs and issuance volumes is 0.47 for non-SG bonds and only 0.28 for SG bonds.[9]

Figure 10 provides an alternative presentation of issuing costs for SG bonds and non-SG bonds. Issuing costs of non-SG bonds are measured along the x-axis and issuing costs of SG bonds are measured along the y-axis. The 45 degree line represents the set of points at which issuing costs for the two sets of bonds are equal.

Figure 10: Differences in issuing costs across state guaranteed and non-state guaranteed bonds



Note: Issuing costs are measured by the z-spread (for fixed rate bonds) and the zero discount margin (for non-fixed rate bonds) based on the CBBT pricing source.
Bonds with extreme issuing costs of less than zero and more than the 95th percentile were dropped from median issuing cost calculations as they most likely reflected bond characteristics outside the scope of the analysis and reporting errors.
Source: Bloomberg

In all quarters in 2009 and 2010, issuing costs for SG bonds are lower than issuing costs for non-SG bonds, as seen previously.

However, the size of the difference between issuing costs over different quarters is of further interest. Consider the year 2009, for instance. Issuing costs were relatively similar between SG and

[9] It is unclear what inferences can be drawn on the basis of the observations above, however. On the one hand, a low correlation between issuance costs for and issuance volumes of SG bonds is consistent with the notion that banks were willing to issue high volumes irrespective of costs. On the other hand, a low correlation is also consistent with investors having been willing to take-up high volumes irrespective of costs. And vice versa for a high correlation between issuance costs for and issuance volumes of SG bonds.

non-SG bonds in the first quarter of 2009. The second quarter of 2009 saw the difference between issuing costs of SG and non-SG bonds grow large before decreasing over the final two quarters of the year.

Figure 11 suggests reasons for the relative location of the data points in Figure 10 above. Namely, investors prefer SG bonds in times of market uncertainty. Figure 11 shows the issuing cost difference between non-SG bonds and SG bonds against market perceptions of uncertainty.[10]

We observe that uncertainty was high in the early part of 2009 but decreased over the course of the year, which is consistent with developments in issuing costs of SG and non-SG bonds from 2009Q2 onwards.

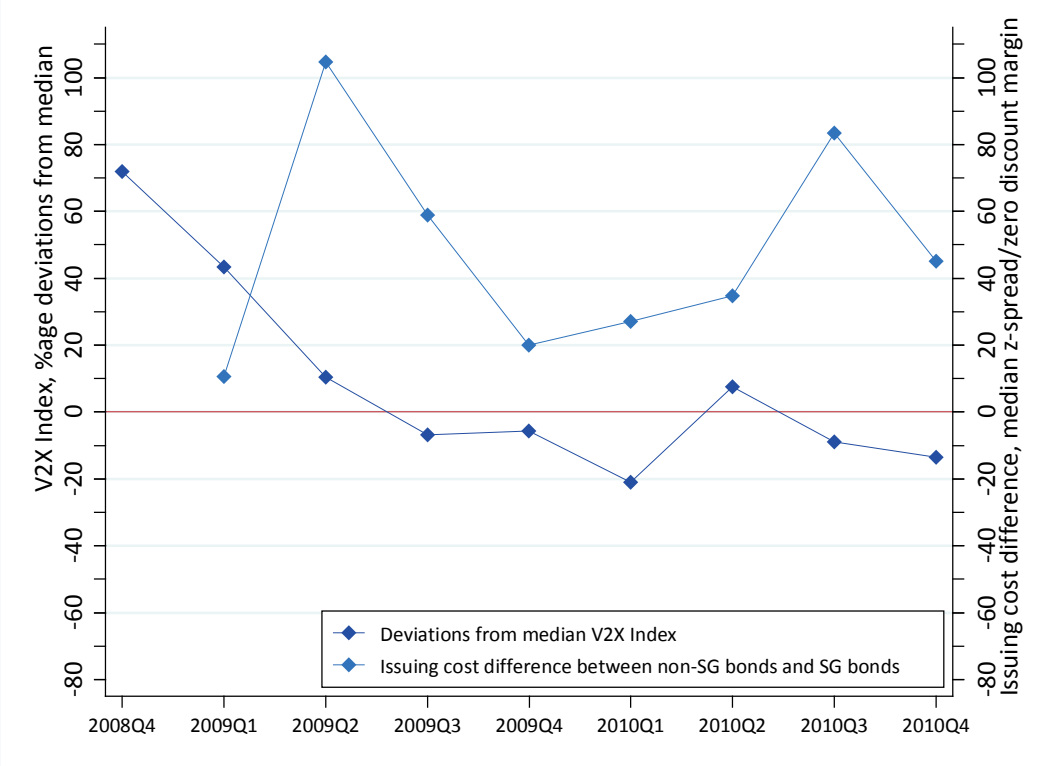
Further, we observe that in 2010Q2 when the issuing costs on SG bonds were among their lowest relative to non-SG bonds, the VSTOXX Index peaked above its median value for the period when it had been below it for the preceding three quarters.

And, we also note that in 2009Q4 when the difference in issuing costs of SG and non-SG bonds was small, the VSTOXX takes amongst its lowest values for the period.

While the VSTOXX Index and issuing costs are not perfectly related to one another (e.g. in 2009Q1), they do suggest that in volatile times investors prefer SG bonds, and perhaps with a lag judging by Figure 11.

[10] Market perceptions of uncertainty are measured through deviations of the VSTOXX Index from its median over 2008Q4 and 2010Q4. The VSTOXX Index measures volatility of the EURO STOXX 50 options prices and is a key indicator of market perceptions of uncertainty. Qualitatively, we view uncertainty as low or high based on deviations of the VSTOXX Index in a given quarter from its median. Specifically, if the aforementioned deviation is below 50% of all values, the VSTOXX Index is low; and if the deviation is above 50% of all values, the VSTOXX Index is high.

Figure 11: Market perceptions of uncertainty, VSTOXX Index, %age deviations from median, 2008Q4-2010Q4



Source: Bloomberg

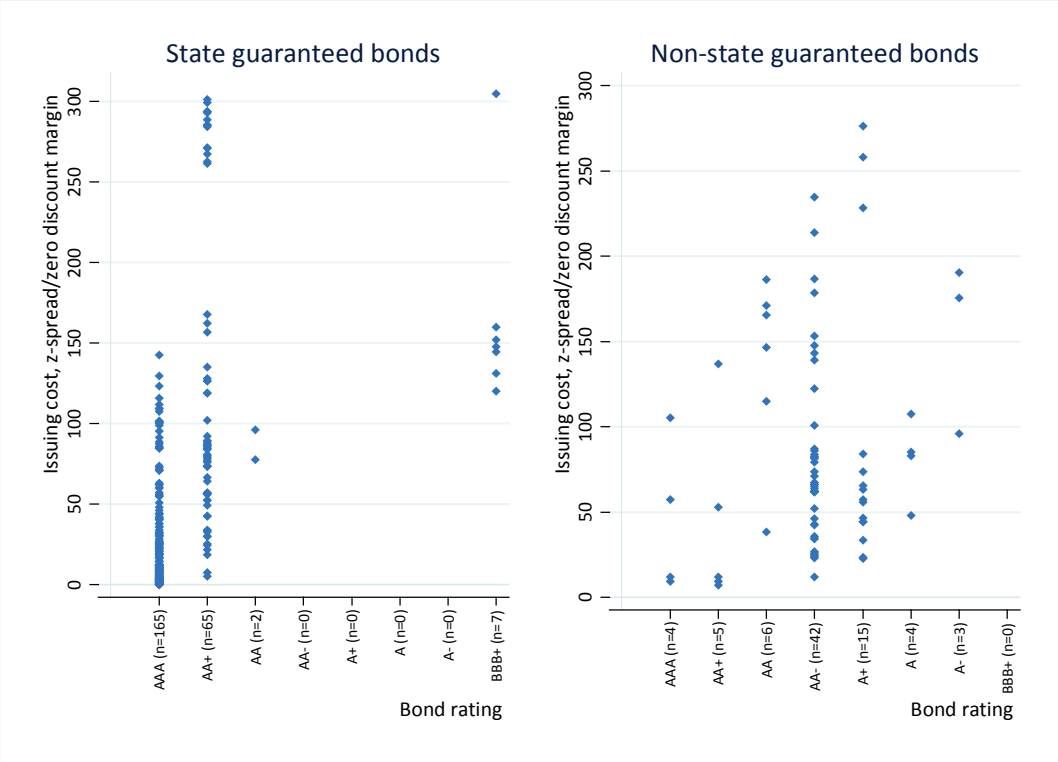
Figure 12 shows SG and non-SG issuing costs by bond rating. There are several noteworthy observations to be made.

Firstly, the higher the bond rating, the lower the issuing cost. This can be observed by the concentration of data points around low issuing costs for top-rated bonds compared to other bonds.

However, secondly, the relationship between bond rating and issuing cost is noisy – for a given level of issuing cost, bond ratings can vary widely. This is partly due to investors taking other factors into account in addition to bond ratings when assessing credit risk. Moreover, the relationship between bond rating and issuing cost is noisier at lower ratings due to these being more widely defined and therefore consisting of a more heterogeneous mix of credit risks.

Thirdly, there are a large number of SG bonds with an AAA or AA+ rating compared to non-SG bonds, which are primarily rated AA- (relative to the total number of SG and non-SG bonds, respectively).

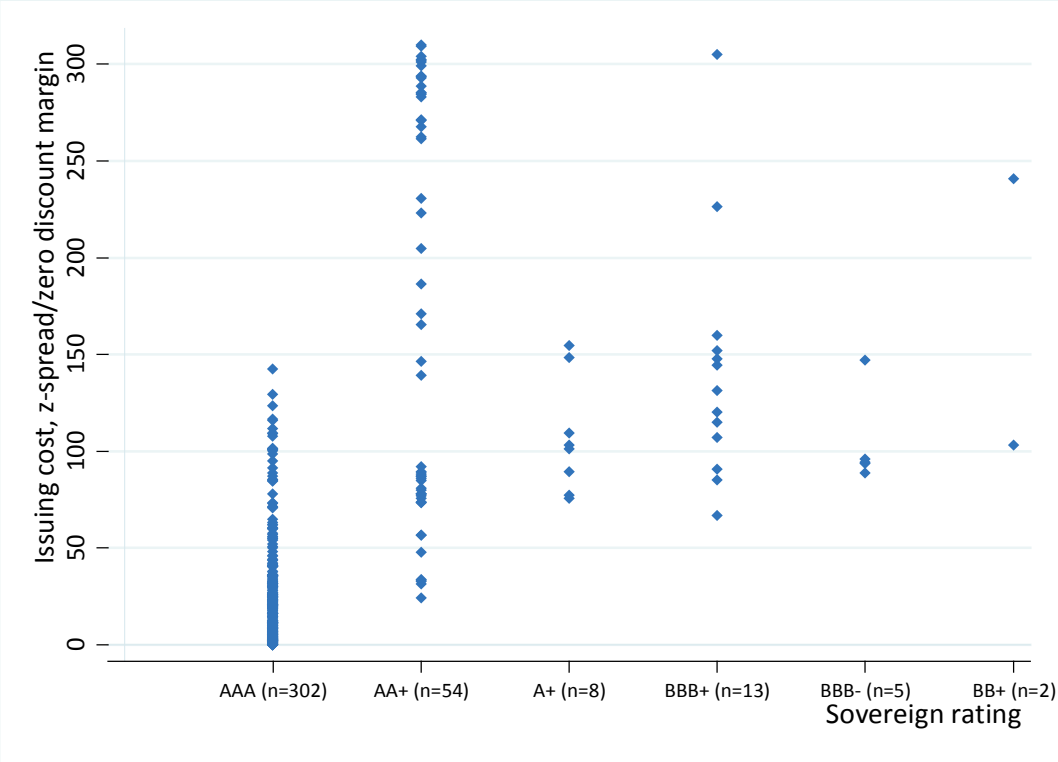
Figure 12: SG and non-SG bond issuing costs by bond rating



Note: Issuing costs are measured by the z-spread (for fixed rate bonds) and the zero discount margin (for non-fixed rate bonds) based on the CBBT pricing source.
Bonds with extreme issuing costs of less than zero and more than the 95th percentile were dropped as they most likely reflected bond characteristics outside the scope of the analysis and reporting errors
Bond ratings are not available for a number of bonds, however, this missing data is distributed similarly across SG and non-SG bonds (see Annex 3 for details)
Source: Bloomberg

Finally, Figure 13 shows SG bond issuing costs by sovereign rating. In general, higher sovereign ratings are associated with lower issuing costs for SG bonds. Additionally, for a given sovereign rating, there is dispersion in SG bond issuing costs, as seen in Figure 12 for bond ratings.

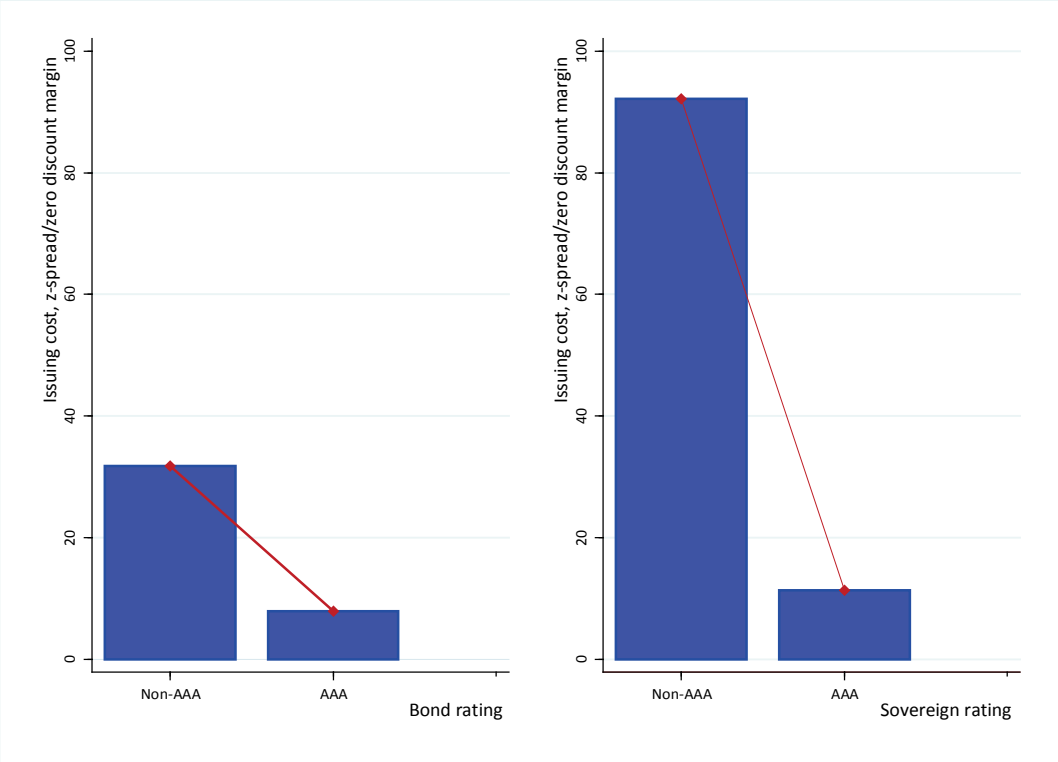
Figure 13: SG bond issuing cost by sovereign rating



Note: Issuing costs are measured by the z-spread (for fixed rate bonds) and the zero discount margin (for non-fixed rate bonds) based on the CBBT pricing source.
Bonds with extreme issuing costs of less than zero and more than the 95th percentile were dropped as they most likely reflected bond characteristics outside the scope of the analysis and reporting errors
Source: Bloomberg

The correlation between sovereign rating and SG bond issuing costs (0.53) is somewhat higher than between bond rating and SG bond issuing costs (0.44). This finding is in line with other studies that have found evidence of "strong" Member States propping up "weak" financial institutions (see Levy and Schich, 2010; and Panetta et al., 2009) and can be seen in Figure 14. On average, the difference in issuing costs of AAA-rated SG bonds and non-AAA-rated SG bonds is 23.8 bps, while the difference in issuing costs of SG bonds backed by AAA-rated and non-AAA-rated sovereigns is 80.7 bps. Section 3.5 below addresses this issue econometrically through the inclusion of a measure of sovereign CDS spreads as a control for the impact of sovereign rating on issuing cost.

Figure 14: SG bond issuing cost by bond rating and sovereign rating



Note: Issuing costs are measured by the z-spread (for fixed rate bonds) and the zero discount margin (for non-fixed rate bonds) based on the CBBT pricing source.
Bonds with extreme issuing costs of less than zero and more than the 95th percentile were dropped as they most likely reflected bond characteristics outside the scope of the analysis and reporting errors
Source: Bloomberg

In summary, this section presented observations regarding the patterns of issuing costs. The main findings are:

- SG bonds had substantially lower issuing costs than non-SG bonds.
- There is little evidence of a relationship between issuance volume and issuing costs, especially for SG bonds. This suggests that gaining access to funding rather than the cost of access was relevant to banks' decisions to participate in state guarantee schemes.
- The difference between issuing costs for SG bonds and non-SG bonds is partly due to the certainty of returns provided by a state guarantee. That is, the difference in issuing costs is higher when market volatility is high.
- Bond issuing costs are generally lower for AAA-rated or otherwise highly rated bonds. This is the case for SG and non-SG bonds.
- However, for SG bonds, the relationship between issuing costs and sovereign ratings are somewhat stronger than the relationship between issuing costs and bond ratings suggesting that the standing of the guarantor is more important than that of the bank in bond pricing.

The following sections extend and provide a formal analysis of the findings presented above.

3.5 Direct effects of state guarantees on issuing cost

3.5.1 Introduction and background

A few studies have considered the impact of state guarantees on issuing cost.

Levy and Zaghini (2010) consider the impact of state guarantees on issuing costs based on a sample of 363 SG bonds issued in the period October 2008-March 2009 (these findings are also presented in Panetta et al., 2009).

They make several interesting findings. Firstly, SG bonds with AAA-rated sovereign guarantors are associated with lower issuing costs than non-AAA rated sovereign guarantors. Secondly, SG bonds backed by governments pledging a larger amount of funds overall for state guarantee schemes face lower issuing costs. The authors interpret this effect as a reflection of the value of government commitment to supporting banks through SG schemes. However, they find that in Member States where financial sector rescue schemes represent a greater share of GDP, SG bond issuing costs are higher, possibly due to higher shares signalling systemic weaknesses in the financial system of that Member State. Finally, the terms of SG bonds, particularly the timeliness of payments in case of default, have an impact on issuing costs.

Overall, these estimation results show that country-specific factors have a more important impact on issuing costs than bank- or issue-specific factors. However, these studies concentrate on state guaranteed bonds only without non-state-guaranteed bonds as a reference point.

The strategy of this study is to derive estimates of the difference in issuing costs between banks making use of state guarantees and those not making use of them when controlling for rating and possibly other bank-specific and issuance-specific (maturity) variables.

The following sections present empirical results on the impact of state guarantees on issuing cost and are structured in the following way. Section 3.5.2 outlines the main empirical specification used to isolate the impact of state guarantees on issuing cost.

Sections 3.5.3 and 3.5.4 provide the main results on the impact of state guarantees on issuing costs. State guarantees reduce issuing costs to a statistically significant degree by 33bps, *ceteris paribus*.

Sections 3.5.8 and 3.5.9 describe robustness and sensitivity checks underlying the main results (non-technical readers can proceed to the analysis of spill-over effects of state guarantees on issuing costs in Section 3.6).

3.5.2 Main empirical specification

Our main empirical specification of issuing costs builds on previous studies that consider issuing costs through ratings based reduced form models, as covered in Elton et al. (2004).[11]

[11] These studies are briefly covered below. For a thorough discussion see Elton et al. (2004).

Reduced form models assume that issuing costs are given by discounted cash flows taking credit ratings into account. This framework is considered in Duffie and Singleton (1997), Duffee (1999), Jarrow, Lando and Turnbull (1997) and Lando (1997) for example.

Empirically, the difficulty of calculating discounted cash flows arises due to the uncertainty with which these arise (e.g. due to issuer default). Duffie and Singleton (1997) and Jarrow, Lando and Turnbull (1997) and Lando (1997) assume that uncertainty can be captured as some function of credit spreads at the level of a single firm or group of firms with a given credit rating.

However, Elton et al. (1999) show that this approach leaves variation in issuing costs unexplained, and that the addition of other factors leads to an improvement in the amount of explained variation. These factors relate to default and maturity risk, liquidity and interest rate risk, bond clauses, primary market efficiency and systematic characteristics.

Each of the abovementioned factors are taken into account in our main empirical specification. In the context of this study, we also investigate the influence of policy variables related to state guarantee schemes and ad hoc guarantees to banks.

The main empirical specification considered is based on an OLS regression of the model below for the pool of SG and non-SG bonds issued in the period October 2008 – December 2010.

$$ISSUING\ COST_{it} = \alpha + \beta_1\ GUARANTEE_i + \beta_2\ RATING_i + \beta_3\ MATURITY_{it} + \beta_4\ SOV_{it} + \beta_5\ LIQUID_i + \beta_6\ PRIVATE_i + \beta_7\ VOL_{it} + \boldsymbol{\gamma\ CURRENCY_i + \delta\ COUPON_i + \eta\ T_i} + \varepsilon_{it} \quad (4)$$

For each bond issue, i, at issue date, t:

- $ISSUING\ COST_{it}$ is the issuing cost of the bond at issue
- $GUARANTEE_i$ is an indicator for whether the bond is state guaranteed or not
- $RATING_i$ is an indicator for whether the bond was AAA-rated or otherwise
- $MATURITY_{it}$ is the time to maturity at issue of the bond
- SOV_i is the sovereign CDS rate for the country of risk of the bond
- $LIQUID_i$ is the amount issued of the bond
- $PRIVATE_i$ is an indicator for whether the bond was privately placed or otherwise
- VOL_{it} is the value of VSTOXX Index in the month of issue of the bond
- $\boldsymbol{CURRENCY_i}$ is a vector of dummies for whether the currency-denomination of the bond is USD- or EUR-denominated
- $\boldsymbol{COUPON_i}$ is a vector of dummies for whether the interest rate type of the bond is fixed or floating
- $\boldsymbol{T_i}$ is a vector of time dummies
- α is a constant
- β, γ and η are coefficients of determinants of issuing cost and ε_{it} is an observation-specific error term.

VOL_{it} and $\boldsymbol{T_i}$ capture aspects of variation over time. These and the other abovementioned variables were described in detail in Section 3.2.2.

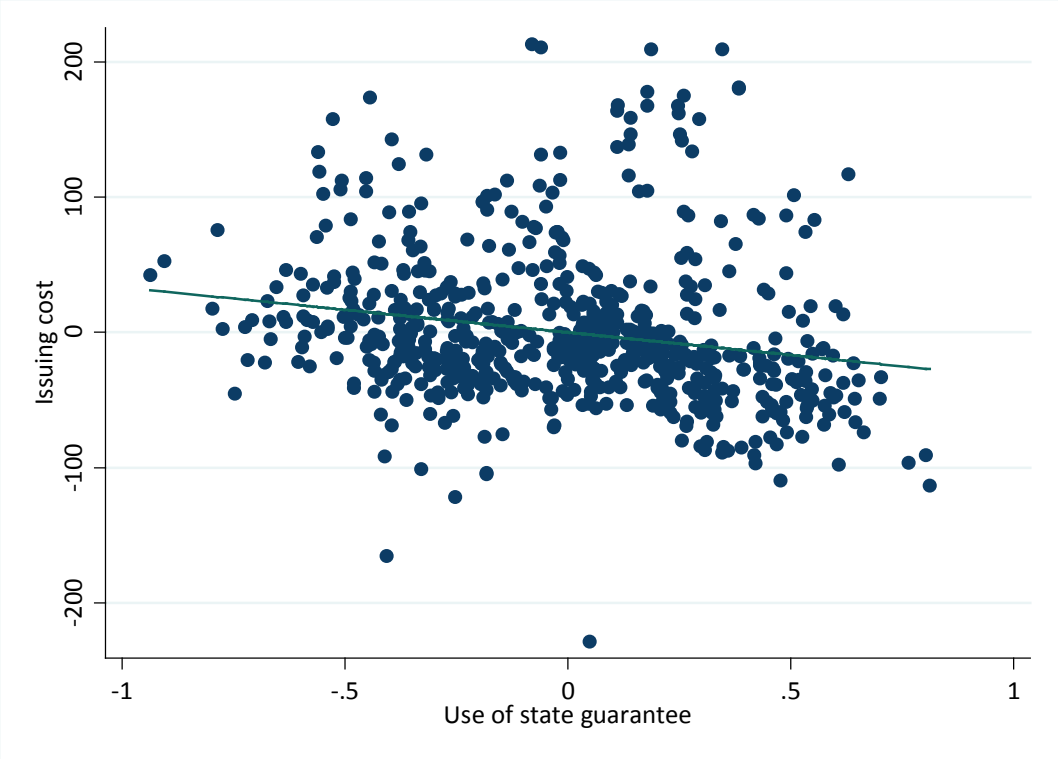
This approach is also adopted in Panetta et al. (2009) and Levy and Zaghini (2010), however for a sample of SG bonds only.

3.5.3 Baseline impact

Table 8 on page 61 provides details of the estimation results of the model specification described in Section 3.5.2.

The baseline result is that SG bonds face lower issuing costs than non-SG bonds on average, controlling for other determinants of bond issuing costs. Specifically, the use of a state guarantee is associated with a Z-spread (in the case of fixed rate bonds) and zero discount margin (in the case of floating rate bonds) that is 33.4 basis points lower than otherwise would have been the case. This result is statistically significant at the 1%-level and is shown below in a partial regression plot of the average impact of state guarantees on issuing cost.

Figure 15: Partial regression plot of baseline impact of state guarantees on issuing cost (n=683)



Note: Issuing costs are measured by the z-spread (for fixed rate bonds) and the zero discount margin (for non-fixed rate bonds) based on the CBBT pricing source.
Bonds with extreme issuing costs of less than zero and more than the 95th percentile were dropped as they most likely reflected bond characteristics outside the scope of the analysis and reporting errors

Details of the estimation results are shown in column 1 of Table 8. The issuing cost model explains 33% of the variation of issuing costs according to the adjusted-R^2 measure.

The other statistically significant coefficients operate in the expected direction. An AAA-rated bond is associated with an issuing cost of 31.3 basis points lower than a non-AAA-rated bond, *ceteris paribus*. A higher sovereign CDS rate is associated with a higher issuing cost. And, a bond

that pays a variable interest rate as opposed to a fixed interest rate results, on average, in a higher issuing cost.

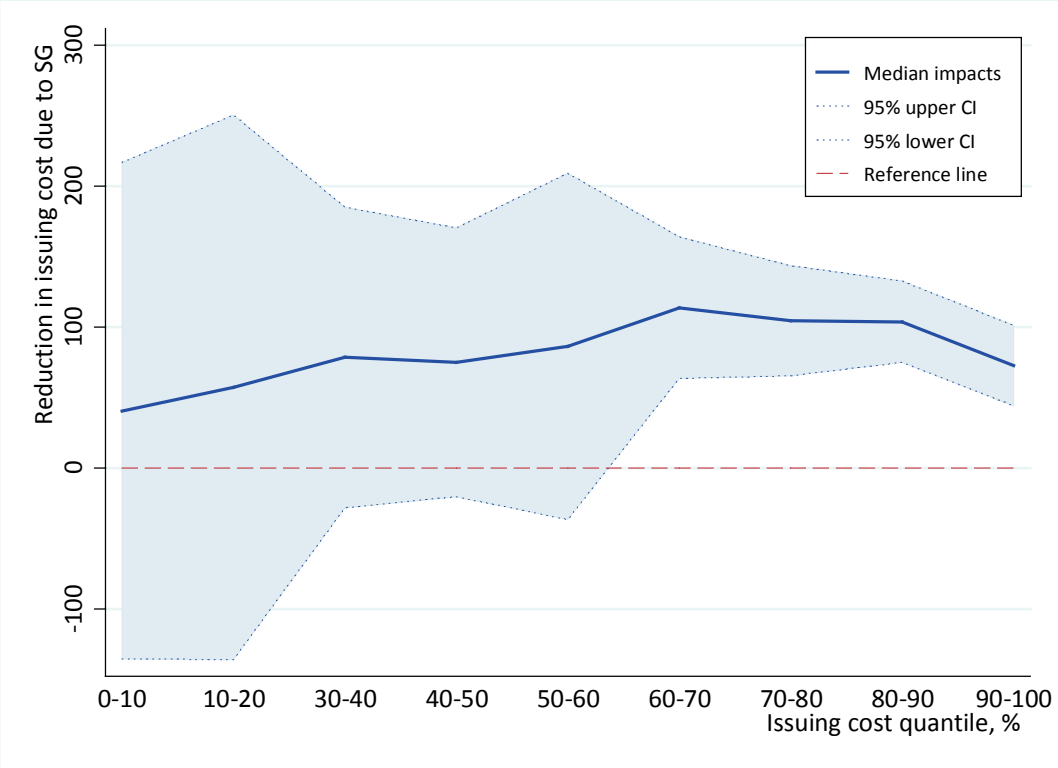
The sign of the majority of the other estimated coefficients is also expected though the estimated coefficients are statistically insignificant.

3.5.4 Distribution of impacts

Figure 16 presents the distribution of impacts of the use of state guarantees on issuing cost based on a quantile regression of the main empirical specification.

The benefits of using quantile regression are twofold. Firstly, estimates are provided for the distribution of impacts, which are of useful analytically. And secondly, quantile regressions report median effects rather than mean effects, which controls for the influence of outliers. This is especially important in the presence of noisy data, which may be relevant in the current context, as regards issuing cost data.

Figure 16: Distribution of impacts of use of state guarantee on issuing cost (n=523)



Note: Reduction in issuing costs is measured by the z-spread (for fixed rate bonds) and the zero discount margin (for non-fixed rate bonds) based on the CBBT pricing source.
The x-axis, 'Issuing cost quantile', relates to the size distribution of issuing costs. For example, the bonds in the '90-100' quantile represent the 10% of bonds with the largest issuing cost values.
Differences between the average (mean) impact of 33bps in the previous section and average (median) impacts of 41-114bps across quantiles in this section are due to the use of the mean average and the median averages, respectively.

The distribution of impacts shows some interesting variation.

In general, the higher the actual issuing cost of a bond, the larger the impact of a state guarantee in reducing it. Specifically, bond issues in the 60-90th percentile have an issuing cost that is in the region of 100bps lower than without the state guarantee ceteris paribus.

The distribution suggests, therefore, that state guarantees benefit the banks and bond issues that are regarded by investors as posing more credit risk. From a policy perspective, this finding is interesting in that state guarantees have the greatest impact (insofar as the reduction in issuing costs is largest) amongst the banks that had greatest difficulty in accessing wholesale funding.

However, it must also be noted that at each issuing cost quantile, the impact of state guarantees is heterogeneous. For instance, while the average impact in the 60-90th percentile was approximately 100bps, the 95% upper and lower confident intervals were 160bps and 60bps, respectively.

3.5.5 Impacts by guarantor

The motivation for analysing impacts of state guarantees by guarantor relates to the concern that differences in the design of Member States' guarantee schemes caused the efficacy of state guarantees to vary across the European Union.

Alternatively/in addition to this, it may be the case that differences in sovereign risk have been more important in determining the impact of state guarantees than issue risk. This relates to the earlier discussion regarding the relationship between sovereign ratings and issuing costs in Section 3.4. There we found that the relationship between sovereign ratings and issuing costs was stronger than the relationship between bond ratings and issuing costs (see Figure 14). Therefore, the standing of the guarantor appeared to be more important than that of the bank in bond pricing. This observation is corroborated by existing literature that suggests that "strong" Member States have been propping up "weak" financial institutions (see Levy and Schich, 2010; and Panetta et al., 2009).

The overarching concern is the effect state guarantees may have had on competition through financial market fragmentation. Namely, if banks are limited in their ability to access state guarantees to a single or a subset of guarantors *and* the effectiveness of guarantees varies systematically by guarantor, we can conclude that financial markets have become relatively more fragmented than in the absence of state guarantee schemes.

However, on balance the evidence does not suggest financial market fragmentation to any meaningful extent.

We adopted the main empirical specification to test the hypothesis that state guarantees from particular guarantors had an effect on issuing costs additional to the effect expected by state guarantees generally through differences in sovereign risk (captured by the sovereign CDS).[12] The estimation results of this issuing cost model show no statistically significant effect of state guarantees from particular guarantors on issuing cost, as shown in column 2 of Table 8 (page 61).

[12] An interaction term between use of state guarantee ($GUARANTEE_i$) and sovereign CDS (SOV_{it}) was added to the main empirical specification. In addition to any effect of state guarantees on issuing cost that applies on average, the interaction term demarcates any additional effects due to the sovereign risk of particular guarantors.

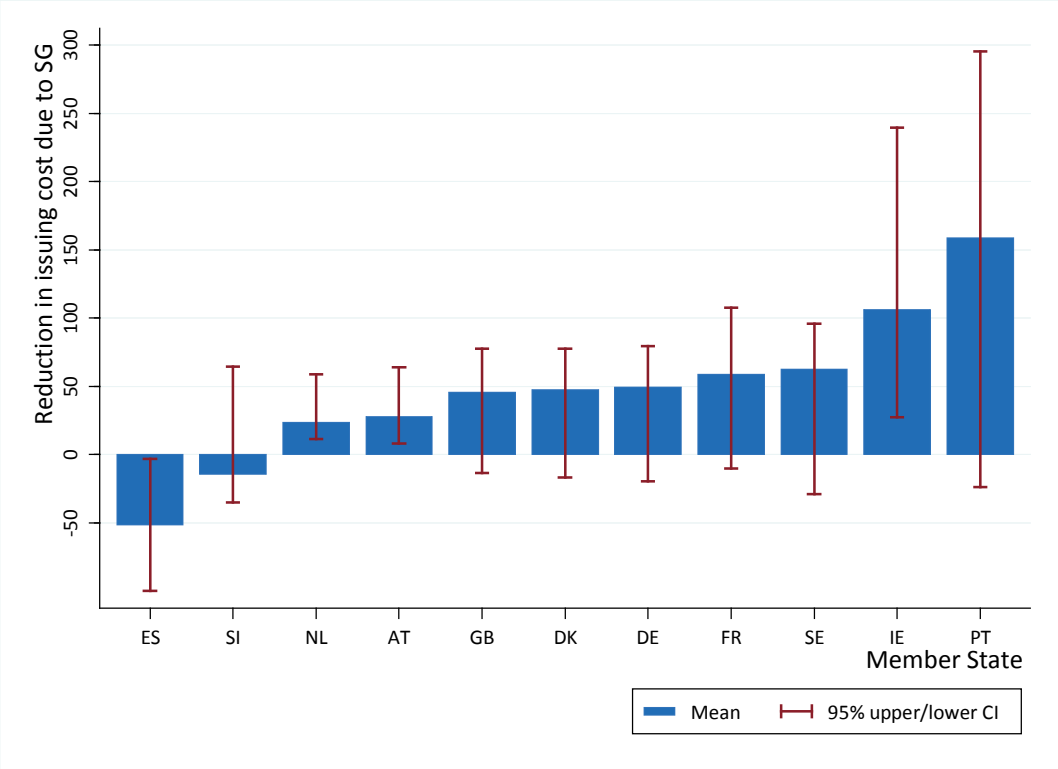
The lack of significance effect, however, may be due to lack of variation in the sovereign CDS variable (SOV_i). In particular, as time-series data for the sovereign CDS variable was unavailable, an average of the period under study was used. This may not have fully captured the relationship between sovereign CDS spreads and issuing conditions at the time of each bond issue. For this and other reasons, we explored the impact of state guarantees by guarantor through another method as well.

While the above analysis considers the relevance of sovereign risk to issuing costs, the approach below investigates the impact of particular guarantors on issuing costs in a broader way.[13] This covers an element of sovereign risk, as previously, but other aspects of the relationship between guarantors and issuing costs, for instance, the abovementioned differences in design of Member States' guarantee schemes.

Figure 17 summarises the main findings of this investigation (while column 3 of Table 8 provides other details of estimation results). The bars show the impacts of state guarantees relating to particular guarantors relative to the average impact of 26.5 bps. The lines show the 95% confidence interval relevant to each of the impacts represented by the bars.

[13] A vector of interaction terms between use of state guarantee ($GUARANTEE_i$) and indicator variables identifying guarantors ($GUARANTOR_i$) were included in the main empirical specification. In addition to any effect of state guarantees on issuing cost that applies on average, the interaction term helps to identify any additional effects of particular guarantors. Results of this estimation are shown in Figure 17.

Figure 17: Incremental reduction of issuing cost through use of state guarantee of particular guarantors (n=683)



Note: Reduction in issuing costs is measured by the z-spread (for fixed rate bonds) and the zero discount margin (for non-fixed rate bonds) based on the CBBT pricing source. Reduction in issuing costs for each guarantor is expressed relative to the average reduction across all guarantors based on the methodology suggested in Suits (1984). Any Member States not shown omitted due to multi-collinearity.

In regard to the issue of financial market fragmentation, the main observations to make are as follows.

Firstly, the majority of guarantor-specific effects relative to the average effect are not statistically significant (as the majority of lines cross the y-axis). On average, this means that differences across guarantors generally did not have an impact on issuing costs.

Secondly, we see that the majority of 95% upper and lower confidence intervals are in a similar range, bar the cases of Ireland and Portugal, which also supports the view that differences across guarantors were not material.

3.5.6 Impacts by bond rating

Thus far, we have found that state guarantees had the baseline impact of reducing issuing costs by approximately 33bps, on average (section 3.5.3). However, we also found that the distribution of impacts varied widely (section 3.5.4) and that this distribution is not explained by guarantor-level factors (section 3.5.5).

This section considers bond-level factors in order to understand the wide distribution of impacts of state guarantees. Specifically, we consider the possibility of a *rating upgrade effect*. That is, the

possibility that, in addition to the baseline impact of state guarantees, there is an incremental effect relating to certain classes of bond ratings. Empirically, we add to the main empirical specification that uses a guarantee ($GUARANTEE_i$) variable and a bond rating ($RATING_i$) variable, interaction terms between use of guarantee and bond ratings.

Table 6 presents the results of this analysis. The figures represent the total impact of state guarantees (baseline impact plus rating upgrade effect).

Table 6: Baseline impact and ratings upgrade effect, by bond ratings, bps (n=390)

Bond rating	Mean	95% lower CI	95% upper CI	Range
AAA	-37.54	-112.6	37.6	150.2
AA+	12.24	-61.4	85.9	147.3
BBB+	-147.8***	-262.9	-32.6	230.2
BBB	-255.6***	-402.9	-108.3	294.6
BBB-	-274.5***	-402.5	-146.5	256.0

Note: Issuing costs is measured by the z-spread (for fixed rate bonds) and the zero discount margin (for non-fixed rate bonds) based on the CBBT pricing source. Issuing costs for each rating is expressed relative to the average reduction across all guarantors based on the methodology suggested in Suits (1984). Rating classes not shown were omitted from estimation due to multi-collinearity.

State guarantees have a sizeable statistically significant impact on the issuing costs of bonds rated BBB-/BBB/BBB+, in the order of over 200bps. And as might be expected, state guarantees had a relatively small and statistically insignificant impact on higher rated bonds.

The intuition behind the rating upgrade effect is as follows. An example is a comparison between a relatively risky bond (e.g. rated BBB) and a relatively safe bond (e.g. AAA) that both received state guarantees. We might expect a rating upgrade effect for the riskier bond because the state guarantee reduces the credit risk embedded within it by more than the baseline state guarantee impact alone. This is less likely to be the case for the safer bond, as receiving a state guarantee may not transform the credit risk embedded in this bond incrementally by as much.

3.5.7 Impacts by bank rating

Following a similar approach to the section above, we estimated the ratings upgrade effect using bank rather than bond ratings. The baseline impact was estimated to be 47.5bps. However, we did not find any statistically significant additional impact through the ratings upgrade effect. These results are shown in Table 7 below.

Table 7: Baseline impact and ratings upgrade effect, by bank rating (n=310)				
Bank rating	**Mean**	**95% lower CI**	**95% upper CI**	**Range**
AAA	91.5	-28.6	211.5	240.1
AA+	110.5	2.7	218.2	215.5
AA	89.9	-13.4	193.3	206.7
AA-	137.8	38.1	237.4	199.3
A+	50.2	-47.2	147.5	194.6
A	68.1	-28.5	164.6	193.1
A-	98.5	10.4	186.6	176.2
BBB+	7.9	-82.2	97.7	179.9
BBB-	-17.3	-106.1	71.5	177.6

Note: Reduction in issuing costs is measured by the z-spread (for fixed rate bonds) and the zero discount margin (for non-fixed rate bonds) based on the CBBT pricing source. Rating classes not shown were omitted from estimation due to multi-collinearity.

Table 8: Estimation results of issuing cost model

	Main estimation model	Alternative models					
		Guarantor-specific impacts		Bank-specific impacts		Bond-specific impacts	
		Sovereign CDS-use of guarantee interactions	Guarantor-use of guarantee interactions	Bank rating-use of guarantee interactions (1)	Bank rating-use of guarantee interactions (2)	Bond rating-use of guarantee interactions (1)	Bond rating-use of guarantee interactions (2)
Use of state guarantee ($GUARANTEE_i$)	**-33.4*** (6.36)**	**-33.3*** (6.42)**	**-26.5*** (14.4)**	**-141.7*** (38.2)**	**-88.8* (50.4)**	**101.1* (54.3)**	**8.45 (37.1)**
Sovereign CDS-guarantee interaction (SOV_i*$GUARANTEE_i$)		**-0.11 (0.14)**					
Guarantor-guarantee interactions ($GUARANTOR_i$*$GUARANTEE_i$)			**See Figure 17**				
Bank rating-guarantee interaction ($RATING_j$*$GUARANTEE_i$)				**12.8*** (4.53)**			
Bank rating dummies-guarantee interactions ($RATING_j$*$GUARANTEE_i$)					**See Table 7**		
Bond rating-guarantee interaction ($RATING_j$*$GUARANTEE_i$)						**-7.86* (4.22)**	
Bond rating dummies-guarantee interactions ($RATING_j$*$GUARANTEE_i$)							**See Table 6**
Bond rating ($RATING_i$)	-31.3*** (5.94)	-31.3*** (5.95)	7.86 (7.57)			-7.64 (2.85)	-8.47*** (2.54)
Bank rating ($RATING_j$)				-10.9*** (4.19)	-11.92** (3.95)		
Time to maturity at issue ($MATURITY_{it}$)	-0.321 (2.22)	-0.32 (2.22)	2.80 (1.99)	-.0034 (3.70)	-0.136 (3.66)	5.32* (3.16)	7.50*** (2.83)
Sovereign CDS (SOV_i)	0.223*** (0.0228)	0.234* 0.134	0.317*** (0.110)	0.195*** (0.032)	0.157*** (0.035)	0.041 (0.058)	0.309*** (0.064)

Table 8: Estimation results of issuing cost model

	Main estimation model	Alternative models					
		Guarantor-specific impacts		Bank-specific impacts		Bond-specific impacts	
		Sovereign CDS-use of guarantee interactions	Guarantor-use of guarantee interactions	Bank rating-use of guarantee interactions (1)	Bank rating-use of guarantee interactions (2)	Bond rating-use of guarantee interactions (1)	Bond rating-use of guarantee interactions (2)
Issuance volume ($LIQUID_i$)	-6.07e-9 (4.12e-9)	-6.06e-9 (4.13e-9)	-1.26e-8*** (3.88e-9)	-7.62e-9 (5.55e-9)	1.27e-8** (5.5e-9)	-1.23e-8*** (4.59e-9)	-1.16e-8*** (4.10e-9)
Private placement ($PRIVATE_i$)	2.66 (8.26)	2.66 (8.27)	-6.96 (7.10)	11.5 (11.3)	5.28 (10.7)	-4.66 (11.1)	-7.87 (9.91)
Volatility (VOL_{it})	1.38 (1.20)	1.38 (1.20)	0.890 (1.07)	-0.156 (1.73)	0.784 (1.69)	1.10 (2.12)	1.11 (1.88)
USD-denominated ($CURRENCY\text{-}USD_i$)	-6.73 (5.93)	-6.74 (5.94)	1.81 (5.64)	-28.8*** (9.95)	-25.1*** (9.72)	-3.84 (7.76)	5.16 (7.01)
Non-EUR- and non-USD-denominated ($CURRENCY\text{-}OTHER_i$)	-7.63 (6.22)	-7.62 (6.22)	9.53 (6.36)	-6.49 (11.0)	-0.88 (10.8)	7.11 (9.80)	17.6** (8.84)
Variable interest rate ($COUPON\text{-}VARIABLE_i$)	14.0* (7.29)	-13.9 (7.31)	-11.0* (6.59)	-8.56 (11.7)	-13.5 (11.3)	-5.41 (8.78)	-2.45 (7.82)
Additional controls							
Month of issue dummies (T_i)	Y	Y	Y	Y	Y	Y	Y
Country of risk ($COUNTRY_i$)	N	N	N	N	N	N	N
Bond clauses ($CROSS_i$, $NEGATIVE_i$, $FORCE_i$)	N	N	N	N	N	N	N
Weights							
Selection correction – volume of SG issues by month	N	N	N	N	N	N	N

Table 8: Estimation results of issuing cost model

	Main estimation model	Alternative models					
		Guarantor-specific impacts		Bank-specific impacts		Bond-specific impacts	
		Sovereign CDS-use of guarantee interactions	Guarantor-use of guarantee interactions	Bank rating-use of guarantee interactions (1)	Bank rating-use of guarantee interactions (2)	Bond rating-use of guarantee interactions (1)	Bond rating-use of guarantee interactions (2)
Selection correction – volume of SG issues by country	N	N	N	N	N		N
Number of observations (SG bonds:non-SG bonds)	*683 (495:188)*	*683 (495:188)*	*683 (495:188)*	*310 (226:84)*	*310 (226:84)*	*390 (306:84)*	*390 (306:84)*
Adjusted-R^2	*0.33*	*0.33*	*0.52*	*0.27*	*0.35*	*0.42*	*0.50*

3.5.8 Robustness

The results on the average impact of state guarantees on issuing cost presented above are robust to a number of alternative specifications to the main empirical specification.

Alternative standard errors

Diagnostic tests of the estimation results of the main empirical specification suggest some evidence of heteroscedasticity among residuals.

To address this issue, the main empirical specification was re-estimated using generalised least squares estimation (results reported in Annex A4.3).

Additionally, the main empirical specification was re-estimated such that standard errors account for the possibility of clustering of observations by month of issue (see column 3, below) and country of risk (see column 4, Table 9 below).

The results of these alternative models lend support to main result of the impact of state guarantees on issuing cost as the statistical significance of estimated coefficients are in line with the main empirical specification.

Alternative dependent variables

The main result on the use of state guarantees is also robust to the use of alternative measures of issuing cost, as shown in columns 5 and 6 of Table 9. This includes a Z-spread/zero discount margin measure that uses the BGN pricing source instead of the CBBT pricing source and an adjustment of the main Z-spread/zero discount margin measure to account for exchange rate premia. The coefficients on the use of state guarantees operate in the expected directions and are statistically significant.

Additional/alternative controls

Additional/alternative controls were considered in alternative specifications to account for the possibility that the main result on the impact of state guarantees on issuing cost was actually due other factors, as shown in columns 7-9 of Table 9.

One hypothesis is that only distinguishing between AAA and non-AAA-rated bonds disguises some variation among non-AAA-rated bonds (i.e., between AA+ down to BBB- bonds) that may influence the impact of state guarantees on issuing cost. Therefore, the main empirical specification was re-estimated without the main bond rating variable ($RATING_i$) and instead with a categorical variable capturing AAA-rated bonds as well as different non-AAA-ratings. The main result, however, is robust to this change.

Another hypothesis is that state guarantees are capturing the effect of differences in general economic conditions across countries on differences in issuing cost across SG and non-SG bonds. This may well be the case, for instance, if investors assess that SG bonds in more stable economies as being more attractive than equivalent bonds in less stable economies.

To account for this possibility, country dummies were added to the main empirical specification. However, the previously reported average estimated impact of state guarantees on issuing cost is robust to this change.

A third hypothesis is that differences in bond clauses actually account for differences in issuing cost across non-SG and SG bonds. In an earlier section, for example, it was noted that the presence of a negative pledge clause (reducing credit risk for investors) is likely to be reflected in a lower issuing cost. If SG bonds contain a disproportionate amount of negative pledge clauses, these may show up as the impact of state guarantees when they are not.

To account for this, bond clauses were added as controls to the main empirical specification and, as with country dummies, the main result on the impact of state guarantees is robust to this change.

3.5.9 Sensitivity of empirical strategy

Our main empirical specification used the population of eligible banks and non-SG bonds as the control group for measuring the impact of state guarantees on issuing cost. This is reasonable as long as the controls chosen sufficiently capture differences in issuing costs not accounted for by state guarantees.

However, there remains the concern that unobservable differences between SG and non-SG bonds are driving the main results.

Alternative weights for SG and non-SG bonds were used to test for the sensitivity of our empirical strategy to unobservables and as shown in columns 10-12 of Table 9.

Two control groups were constructed to control for unobserved time- and Member-State-specific factors, which includes specificities in bond market conditions, other public support measures, short-term funding and central bank measures.

Practically, non-SG bonds issued at the same time and/or relating to the same country of risk as SG bonds were given more weight in the analysis as they were viewed to share greater similarlities than other non-SG bonds.

Qualitatively, the main result holds across all three alternative weights specified. That is, state guarantees reduce issuing cost to a statistically significant degree whether non-SG bonds issued at the same time as SG bonds are emphasised in the control group and/or non-SG bonds relating to the same country of risk are emphasised in the control group.

Quantitatively, the average impact of a state guarantee is in the region of 45-55bps reduction in Z-spread based on two of the alternative weighting schemes. This is in the region of the majority of other alternative specifications considered.

However, the comparison of SG and non-SG bonds relating to the same country of risk suggests that the average impact of a state guarantee on reducing issuing cost is 18bps (column 11 in Table 9). This is interesting because it suggests that state guarantees are more effective in some Member States than others even accounting for differences in sovereign risk (reflected through the sovereign CDS) and country risk controls.

Table 9: Robustness and sensitivity of estimation results of issuing cost model

Variable	Main estimation model	Alternative estimation models									
		Alternative standard errors		Alternative dependent variables		Additional/alternative controls			Alternative weights (sensitivity of empirical strategy)		
		Clustered SEs (by month)	Clustered SEs (by country)	Alternative pricing source	Exchange rate premia-adjusted	Alternative (refined) bond ratings	Addition of country of risk dummies	Addition of bond clauses	SG issuance volume by month of issue	SG issuance volume by country of risk	Combined alternative weights
Use of state guarantee (*GUARANTEE*$_i$)	**-33.4*** (6.36)**	**-33.4*** (8.51)**	**-33.4** (14.6)**	**-37.5*** (5.70)**	**-37.9*** (7.52)**	**-36.8*** (8.45)**	**-44.5*** (7.37)**	**-57.4*** (11.5)**	**-45.6*** (7.96)**	**-18.0*** (8.11)**	**-55.5*** (8.41)**
Bond rating (*RATING*$_i$)	-31.3*** (5.94)	-31.3*** (6.96)	-31.3** (14.4)	-27.9*** (5.33)	-27.1*** (7.45)	-7.5***[1] (1.00)	0.223 (6.67)	-0.148 (12.0)	-7.56 (4.99)	-35.4*** (7.18)	5.74 (6.89)
Time to maturity at issue (*MATURITY*$_{it}$)	-0.321 (2.22)	-0.321 (2.49)	-0.321 (3.20)	1.18 (1.99)	0.850 (2.49)	5.4* (3.03)	1.38 (2.01)	-0.735 (3.17)	7.69*** (2.18)	18.1*** (3.04)	11.5*** (2.34)
Sovereign CDS (*SOV*$_i$)	0.223*** (0.0228)	0.223*** (.0375)	0.223** (0.0835)	-0.170*** (0.0210)	0.187*** (0.0253)	0.3*** (0.03)	0.164*** (0.0512)	0.239*** (0.0768)	0.356*** (0.0247)	0.0493 (0.0451)	0.23*** (0.032)
Issuance volume (*LIQUID*$_i$)	-6.07e-9 (4.12e-9)	-6.07e-9 (4.35e-9)	-6.07e-9* (3.43e-9)	-5.07e-9 (3.68e-9)	-4.82e-9 (4.87e-9)	1.1e-8*** (4.4e-9)	-1.36e-8*** (3.83e-9)	-1.01e-8** (5.14e-9)	1.60e-9 (3.96e-9)	-5.59e-9** (2.62e-9)	-2.94e-8*** (2.40e-9)
Private placement (*PRIVATE*$_i$)	2.66 (8.26)	2.66 (11.1)	2.66 (6.88)	-0.906 (7.50)	28.2 (20.0)	-3.9 (10.74)	-0.543 (7.12)	-4.28 (12.2)	-20.8** (9.17)	15.6*** (5,12)	2.51 (4.84)
Volatility (*VOL*$_{it}$)	1.38 (1.20)	1.38 (0.535)	1.38 (1.18)	0.809 (1.07)	0.850 (1.30)	1.6 (2.04)	1.63 (1.12)	1.07 (1.57)	1.12 (1.66)	-1.88 (1.56)	2.77 (2.74)
USD-denominated (*CURRENCY-USD*$_i$)	-6.73 (5.93)	-6.73 (7.58)	-6.73 (17.0)	-0.189 (5.33)	-13.8 (12.7)	1.7 (7.48)	2.04 (5.63)	-9.55 (8.54)	2.87 (5.58)	-11.1* (5.86)	3.13 (4.25)
Non-EUR- and non-USD-denominated (*CURRENCY-OTHER*$_i$)	-7.63 (6.22)	-7.63 (6.80)	-7.63 (17.3)	-1.56 (5.61)	-56.4 (16.4)	11.8 (9.51)	6.62 (6.26)	5.13 (9.49)	-5.69 (5.59)	19.4*** (5.82)	43.5*** (4.85)
Variable interest rate (*COUPON-VARIABLE*$_i$)	14.0* (7.29)	14.0* (10.2)	14.0 (11.8)	-23.0*** (6.55)	-24.1*** (8.78)	-4.5 (8.49)	-1.20 (6.89)	12.0 (9.49)	-12.3 (7,35)	-21.0*** (6.19)	-86.3*** (5.96)

Table 9: Robustness and sensitivity of estimation results of issuing cost model

Variable	Main estimation model	Alternative estimation models									
		Alternative standard errors		Alternative dependent variables		Additional/alternative controls			Alternative weights (sensitivity of empirical strategy)		
		Clustered SEs (by month)	Clustered SEs (by country)	Alternative pricing source	Exchange rate premia-adjusted	Alternative (refined) bond ratings	Addition of country of risk dummies	Addition of bond clauses	SG issuance volume by month of issue	SG issuance volume by country of risk	Combined alternative weights
Additional controls (not displayed)											
Month of issue dummies (T_i)	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
Country of risk ($COUNTRY_i$)	N	N	N	N	N	N	Y	Y	N	N	N
Bond clauses ($CROSS_i$, $NEGATIVE_i$, $FORCE_i$)	N	N	N	N	N	N	N	Y	N	N	N
Weights											
Selection correction: volume of SG issues by month	N	N	N	N	N	N	N	N	Y	N	Y
Selection correction: volume of SG issues by country	N	N	N	N	N	N	N	N	N	Y	Y
Number of observations (SG bonds:non-SG bonds)	*683 (495:188)*	*683 (495:188)*	*683 (495:188)*	*671 (483:188)*	*402 (259:143)*	*390 (306:84)*	*683 (495:188)*	*378 (260:118)*	*651 (587:63)*	*601 (523:78)*	*570 (472:98)*
Adjusted-R^2	*0.33*	*0.36*	*0.36*	*0.34*	*0.42*	*0.40*	*0.52*	*0.51*	*0.36*	*0.43*	*0.53*

Note: * p<.1 ** p<.05 *** p<.01, SE (standard error), - (omitted), 1 Bond rating ($RATING_i$) in this specification is given by a categorical variable capturing the marginal impact of a one rung improvement in bond rating rather than the impact of switching from non-AAA to AAA status as is the case in other specifications

3.6 Indirect effects of state guarantees on issuing cost

This section provides empirical results on the indirect effects of state guarantees on issuing costs. For a given bond, indirect effects are defined as issuing costs resulting from other bond issuance activity. Spill-over effects – the specific effect on non-SG bond issuing costs of SG bond issuance activity – are a subset of indirect effects and are also considered in this section.

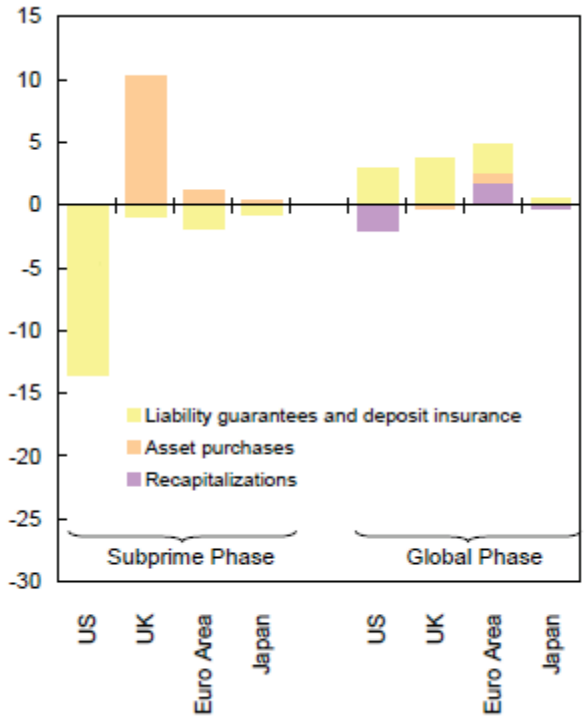
Since state guarantees constitute state aid, which is inconsistent with Internal Market rules except under specific conditions (Article 107 TFEU), the Commission are interested in the extent to which they distort competition among banks that used state guarantees and those that did not.

One previous study (Ait-Sahalia et al., 2009) has considered indirect effects of state guarantees through an event study of the announcement of state guarantee schemes in the euro area, UK and US on issuing costs.[14] It finds that the announcement of state guarantee in the euro area, UK and US prior to the collapse of Lehman Brothers led to a reduction in issuing costs in other territories. However, it found that announcements of schemes after the collapse of Lehman Brothers had no statistically significant impact on issuing costs.

These findings are summarised in Figure 18 through the light yellow bars. The figure shows that the contribution of announcements of state guarantees to changing issuing costs overall was in the order of +/- 5 bps in the euro area and UK.

[14] This study analyses developments in the LIBOR-OIS spread as a measure of the interbank risk premium.

Figure 18: Magnitude and statistical significance of the LIBOR-OIS spread response to domestic and foreign policy announcements, bps



Note: The figures show the contribution of different types of policy announcements to the overall impact of announcements in the respective policy category by country, in basis points. The contribution of each type of announcement is calculated according to the equation (10) in Appendix I of Ait-Sahalia et al. (2009), as the average cumulative abnormal differences (ACAD) for the respective type of announcement, scaled by the ACAD of the respective category of policy announcement, both within the window of 1 day before the announcement and 3 days after the announcement.

Source: Ait-Sahalia et al., 2009

The event study methodology used provides an indication of the short-term indirect effects of state guarantees. The empirical analysis provided below build on these findings by providing empirical results on long-term indirect effects.

3.6.1 Main empirical specification

The main empirical specification used in the assessment of indirect effects of state guarantees on issuing cost builds on that used to measure the direct impact of state guarantees on issuing cost.

For a given bond, the indirect effect is defined as the impact of other bond issues on issuing cost.

Our approach to measuring indirect effects uses variation in the intensity of use of state guarantees over time. The benefit of this approach is that variations in the intensity of the use of state guarantees over time are likely to be exogenous to the issuing costs of any single bank.

An OLS regression of the model is estimated using the pool of SG and non-SG bonds issued in the period October 2008 – December 2010. This is similar to the main empirical specification for

capturing the impact of state guarantees on issuing cost but with the addition of variables relating to issuing intensity.

$$ISSUING\ COST_{it} = \alpha + \beta_1\ SG\ ISSUING\ INTENSITY_{im} + \beta_2\ NON\text{-}SG\ ISSUING\ INTENSITY_{m} + \beta_3\ GUARANTEE_i + \beta_4\ RATING_i + \beta_5\ MATURITY_{it} + \beta_6\ SOV_{it} + \beta_7\ LIQUID_i + \beta_8\ PRIVATE_i + \beta_9\ VOL_{it} + \boldsymbol{\gamma}\ \boldsymbol{CURRENCY_i} + \boldsymbol{\delta}\ \boldsymbol{COUPON_i} + \varepsilon_{it} \quad (5)$$

For each bond issue, i, at issue date, t, in issuing month, m:

- $ISSUING\ COST_{it}$ is the issuing cost of the bond at issue
- $SG\ ISSUING\ INTENSITY_{im}$ is the total volume of SG bonds issued in the month of issue of the bond
- $NON\text{-}SG\ ISSUING\ INTENSITY_{im}$ is the total volume of non-SG bonds issued in the month of issue of the bond
- $GUARANTEE_i$ is an indicator for whether the bond is state guaranteed or not
- $RATING_i$ is an indicator for whether the bond was AAA-rated or otherwise
- $MATURITY_{it}$ is the time to maturity at issue of the bond
- SOV_i is the sovereign CDS rate for the country of risk of the bond
- $LIQUID_i$ is the amount issued of the bond
- $PRIVATE_i$ is an indicator for whether the bond was privately placed or otherwise
- VOL_{it} is the value of VSTOXX Index in the month of issue of the bond
- $\boldsymbol{CURRENCY_i}$ is a vector of dummies for whether the currency-denomination of the bond is USD- or EUR-denominated
- $\boldsymbol{COUPON_i}$ is a vector of dummies for whether the interest rate type of the bond is fixed or floating
- α is a constant
- β, γ and η are coefficients of determinants of issuing cost and ε_{it} is an observation-specific error term.

3.6.2 Average impact

Table 10 shows evidence that there was a small but statistically significant indirect effect of SG bonds. The larger the aggregate volume of SG bonds issued, the higher the issuing costs faced by banks. This is likely to be due to supply and demand effects insofar as the greater the demand for investor funds, the higher the level of credit spreads investors require in order to take-up any particular bond issue, all else equal. Table 10 shows that for each additional €1bn of SG bonds issued in a given month, the magnitude of this indirect effect is in the region of increasing issuing costs by 0.04bps.

Table 10: Estimation results of indirect effects model	
Variable	
Aggregate volume of SG bond issues *(SG ISSUING INTENSITY$_{im}$)*	**0.0400***** **(0.0111)**
Aggregate volume of non-SG bond issues *(NON-SG ISSUING INTENSITY$_{im}$)*	0.0405 (0.0350)
Use of state guarantee (*GUARANTEE$_i$*)	-51.2*** (5.33)
Bond rating (*RATING$_i$*)	-2.06 (4.64)
Time to maturity at issue (*MATURITY$_{it}$*)	2.23 (1.47)
Sovereign CDS (*SOV$_i$*)	0.0600 (0.0451)
Issuance volume (*LIQUID$_i$*)	-9.70e-9*** (2.70e-09)
Private placement (*PRIVATE$_i$*)	-1.66 (5.42)
Volatility (*VOL$_{it}$*)	0.651** (0.298)
USD-denominated (*CURRENCY-USD$_i$*)	3.95 (4.09)
Non-EUR- and non-USD-denominated (*CURRENCY-OTHER$_i$*)	7.08 (4.65)
Variable interest rate (*COUPON-VARIABLE$_i$*)	-26.7*** (5.10)
Additional controls (not displayed)	
Country of risk *(COUNTRY$_i$)*	Y
Number of observations	*647*
Adjusted-R^2	*0.50*

Note: SE (standard error), - (omitted)
* p<.1 ** p<.05 *** p<.01

3.6.3 Unpacking the causal mechanism

Differences between issuing and non-issuing banks

From a competition perspective, a key policy question relates to whether SG bonds influence the issuing costs of non-SG bonds issued by non-participating banks.

We can conclude that if there were no indirect effect of this nature, then there were no material distortions to competition resulting from SG bonds. However, this conclusion could not be drawn if SG issuing intensity influenced the issuing costs of non-SG bonds.

For this reason, the main empirical specification is re-estimated for different subsamples of banks. Specifically, we compared the indirect effect of SG issuing activity on participating and non-

participating banks, and SG bonds and non-SG bonds. The results of this analysis are presented in Table 11.

The indirect effect on the issuing costs of banks that received no state guarantees is compared to that faced by banks that did receive state guarantees. The results are unsurprising insofar as there is a negative indirect effect on both types of bank in the order of 0.04-0.08bps for each additional €1bn SG bond issue.

In regard to banks that received state guarantees, this finding indicates that the net effect of SG bond issuing activity on issuing cost is lower than the direct effect estimated previously once one accounts for the indirect effect of other SG bonds being issued. On average, €263bn of SG bonds was issued per month implying that the indirect effect of SG issues on a given bond was -10.5bps (€263bn*0.0400bps). This means that the net effect of state guarantees was in the order of 22.9bps on average (33.4-10.5).

It is interesting to note that the indirect effect on the issuing costs of banks not issuing SG bonds is larger than on the issuing costs of banks issuing SG bonds. Indeed, the indirect effect of SG bonds on the issuing costs of banks not issuing SG bonds is in the order of 20.3bps (€263bn*0.0771bps), on average.

This difference was investigated in more detail by re-estimating the main empirical specification for indirect effects on a subsample of SG and non-SG bonds issued by banks participating in state guarantee schemes only.

Interestingly, the estimated[15] indirect effect on non-SG bonds issued by banks participating in state guarantee schemes in the order of -0.06bps for each additional €1bn SG bond issue. This suggests that participation in a state guarantee scheme may signal bank-level financial stability that results in the issuing cost of non-SG bonds being lower than for otherwise similar non-SG bonds (although this effect is not significant due to the small sample size).

Re-estimating the main empirical specification on the impact of state guarantees on issuing cost supports this view. While the average impact of a state guarantee on issuing cost is 33.4bps, the estimated impact for the subsample of banks issuing both SG bonds and non-SG bonds is 56.7bps.

[15] It is important to note that in the context of the analysis of the impact of the issuance of SG bonds on the issuance cost of SG and non-SG bonds, an externality is defined as negative if the effect of the issuance of SG bonds is to increase the issuance cost of all bonds and as a positive externality if the effect is to reduce issuance cost.

Table 11: Estimation results of indirect effects, by bank and bond groups

Variable	Main estimation model	Subsamples of banks			Subsamples of bonds for participating banks	
		Participating banks	Participating banks (issuing cost model)	Non-participating banks	SG bonds	Non-SG bonds
Aggregate volume of SG bond issues *(SG ISSUING INTENSITY$_{im}$)*	**0.0400***** **(0.0111)**	**0.0411***** **(0.0127)**	-	**0.0771*** **(0.0392)**	**0.0436***** **(0.0129)**	**-0.0604** **(0.0660)**
Aggregate volume of non-SG bond issues *(NON-SG ISSUING INTENSITY$_{im}$)*	0.0405 (0.0350)	0.0126 (0.0452)	-	-0.101 (0.107)	0.0153 (0.0471)	-0.408 (0.205)
Use of state guarantee (*GUARANTEE$_i$*)	-51.2*** (5.33)	-67.6*** (9.90)	**-56.7***** **(14.5)**	-	-	-
Bond rating (*RATING$_i$*)	-2.06 (4.64)	5.37 (5.09)	7.64 (12.1)	-65.2** (30.0)	2.53 (5.11)	-
Time to maturity at issue (*MATURITY$_{it}$*)	2.23 (1.47)	2.42 (1.73)	-1.72 (4.78)	-1.90 (4.41)	1.95 (1.85)	-5.99 (9.42)
Sovereign CDS (*SOV$_i$*)	0.0600 (0.0451)	0.0973 (0.0813)	0.280*** (0.053)	0.213 (0.144)	0.259*** (.0271)	0.843 (0.840)
Issuance volume (*LIQUID$_i$*)	-9.70e-9*** (2.70e-09)	-7.00e-9** (2.81e-9)	-1.45e-8* (7.74e-9)	-1.58e-8 (1.69e-8)	-6.03e-9** (2.86e-9)	-2.01e-8 (1.65e-8)
Private placement (*PRIVATE$_i$*)	-1.66 (5.42)	1.31 (7.19)	10.9 (13.2)	-9.57 (15.5)	2.67 (7.30)	-45.7 (30.1)
Volatility (*VOL$_{it}$*)	0.651** (0.298)	0.305 (0.331)	-0.681 (2.32)	0.594 (1.18)	0.310 (0.334)	0.891 (2.00)
USD-denominated (*CURRENCY-USD$_i$*)	3.95 (4.09)	4.92 (5.02)	-50.5*** (13.1)	16.8 (12.1)	3.66 (5.15)	22.9 (24.1)

Table 11: Estimation results of indirect effects, by bank and bond groups

Variable	Main estimation model	Subsamples of banks			Subsamples of bonds for participating banks	
		Participating banks	Participating banks (issuing cost model)	Non-participating banks	SG bonds	Non-SG bonds
Non-EUR- and non-USD-denominated (*CURRENCY-OTHER$_i$*)	7.08 (4.65)	26.0*** (8.29)	-3.58 (13.9)	-4.43 (15.4)	23.5*** (6.15)	37.2 (34.3)
Variable interest rate (*COUPON-VARIABLE$_i$*)	-26.7*** (5.10)	-18.6*** (5.64)	-3.78 (15.4)	-46.4* (23.5)	-16.8*** (5.65)	-28.4 (52.4)
Additional controls (not displayed)						
Country of risk *(COUNTRY$_i$)*	Y	Y	N	*Y*	Y	Y
Number of observations	*647*	*352*	*200*	*126*	*321*	*38*
Adjusted-R^2	*0.50*	0.54	0.44	*0.20*	*0.49*	*0.34*

Note: SE (standard error), - (omitted)
* p<.1 ** p<.05 *** p<.01

3.6.4 Cross-border impacts of state guarantee schemes

Another important policy question is whether the design of a guarantee scheme in one Member State impacted issuance conditions for banks in a second Member State. In other words, the issue is whether state guarantee schemes had cross-border indirect effects.

A priori, the European Commission Communication on 'The application of State aid rules to measures taken in relation to financial institutions in the context of the current global financial crisis' (European Commission, 2008) established consolidated practice among Member States providing banks with state guarantees. However, in practice, the design of state guarantee schemes and guarantees to particular banks changed over time, which may have led to indirect spill-over effect.

To determine the magnitude of the cross-border indirect effect empirically, the variable for the aggregate indirect effect in the main empirical specification outlined in Section 3.5.2 is decomposed by Member State, with two variables replacing the aggregate volume of SG bond issues (*SG ISSUING INTENSITY*$_{im}$). The first is the aggregate volume of SG bond issues at home (*SG ISSUING INTENSITY*$_{imh}$) and the second is the aggregate volume of SG bond issues abroad (*SG ISSUING INTENSITY*$_{im\text{-}h}$). These variables capture the indirect effect resulting from the SG bond issues at home and cross-border, while the aggregate volume of non-SG issues (*NON-SG ISSUING INTENSITY*$_{im}$) captures the indirect effect resulting from non-SG bonds as before. The dependent variable is still the issuing cost of bond at issue (*ISSUE COST*$_{it}$).

The main results of this analysis are shown in Table 12. They show that the issuance of SG bonds affect issuance conditions at home but not abroad. That is, an additional €1bn home SG bond issue is associated with a statistically significant 1.83bps increase in issuing cost while an additional €1bn SG bond issue abroad is not associated with any statistically significant impact on issuing cost.

The magnitude of the home indirect effect (1.83bps) is larger than the average indirect effect (0.04bps) reported above. This may be due to the use of time dummies in the estimation of the home indirect effect and country dummies in the estimation of the average indirect effect.

To determine whether the home indirect effect was robust to the inclusion of country dummies, we re-estimated the cross-border indirect effects model with this change. Unfortunately, the results of this re-estimation were not valid due to the presence of extreme outliers and multi-collinearity between the independent variables.

Table 12: Estimation results of cross-border indirect effects model	
Variable	
Aggregate volume of SG bond issues at home *(SG ISSUING INTENSITY$_{imh}$)*	**1.83***** **(0.843)**
Aggregate volume of SG bond issues abroad *(SG ISSUING INTENSITY$_{im-h}$)*	**0.363** **(0.386)**
Aggregate volume of non-SG bond issues *(NON-SG ISSUING INTENSITY$_{im}$)*	-0.288 (0.133)
Use of state guarantee (*GUARANTEE$_i$*)	-34.0*** (8.23)
Bond rating (*RATING$_i$*)	-35.4*** 6.58
Time to maturity at issue (*MATURITY$_{it}$*)	0.169 (2.60)
Sovereign CDS (*SOV$_i$*)	0.231*** 0.0239
Issuance volume (*LIQUID$_i$*)	-5.77e-09 (4.68e-09)
Private placement (*PRIVATE$_i$*)	5.54 (9.86)
Volatility (*VOL$_{it}$*)	-0.367 (1.41)
USD-denominated (*CURRENCY-USD$_i$*)	-15.9 (6.92)
Non-EUR- and non-USD-denominated (*CURRENCY-OTHER$_i$*)	-10.5 (7.21)
Variable interest rate (*COUPON-VARIABLE$_i$*)	-4.50 (8.38)
Additional controls (not displayed)	
Month of issue dummies *(T_i)*	Y
Number of observations	*551*
Adjusted-R^2	*0.34*

Note: SE (standard error), - (omitted)
* p<.1 ** p<.05 *** p<.01

3.6.5 Robustness and sensitivity of empirical strategy

Table 13 shows the results of tests of robustness and sensitivity of the empirical strategy of the indirect effects model (analogous to the results of tests of the main issuing cost model presented in Table 9).

The main result is robust to the use of alternative standard errors, two of the three alternative dependent variables, inclusion of additional controls and combined alternative weights. However, it is not robust to the use of SG issuance volume by month of issue or country of risk as separate weights. These results can be observed by the sign, magnitude and statistical significance (or lack thereof) of the *SG ISSUING INTENSITY$_{imh}$* variable.

The main finding of these results is that the significance of the *SG ISSUING INTENSITY*$_{imh}$ variable is sensitive to the use of time dummies/time-specific weights and country dummies/country-specific weights individually. This is expected. These dummies capture bond market conditions in any given month or country while the aggregate volume of SG bond issues variable breaks out a specific aspect of bond market conditions that affect issuing costs.

Table 13: Robustness and sensitivity of estimation results of indirect effects model

Variable	Main estimation model (Table 11)	Alternative estimation models								
		Alternative standard errors		Alternative dependent variables		Additional controls		Alternative weights (sensitivity of empirical strategy)		
		Clustered SEs (by month)	Clustered SEs (by country)	Alternative pricing source	Exchange rate premia-adjusted	Addition of time dummies	Addition of bond clauses	SG issuance volume by month of issue	SG issuance volume by country of risk	Combined alternative weights
Aggregate volume of SG bond issues *(SG ISSUING INTENSITY$_{im}$)*	**0.0400*** (0.0111)**	**0.0396** (.0181)**	**0.0396*** (0.013)**	**0.0416*** (0.0112)**	**0.0466*** (0.014)**	**0.0981*** (0.352)**	**0.0755*** (0.0168)**	**0.0187 (0.0163)**	**0.0452 (0.0350)**	**0.0464* (0.0257)**
Aggregate volume of non-SG bond issues *(NON-SG ISSUING INTENSITY$_{im}$)*	0.0405 (0.0350)	0.0405 (0.0580)	0.0405 (0.0260)	0.0360 (0.0354)	0.050 (0.0440)	-0.0493 (0.109)	0.0383 (0.0559)	0.0650 (0.0516)	0.107 (0.154)	-0.0319 (0.0785)
Use of state guarantee (*GUARANTEE$_i$*)	-51.2*** (5.33)	-51.2*** (4.76)	-51.2*** (7.42)	-51.8*** (5.40)	-52.1*** (7.15)	-67.96*** (7.93)	-59.44*** (7.68)	-59.92*** (5.35)	-16.7** (7.86)	-11.75 (10.02)
Bond rating (*RATING$_i$*)	-2.06 (4.64)	-2.06 (4.39)	-2.06 (7.40)	-1.61 (4.72)	-2.13 (5.63)	-6.45 (8.15)	1.14 (8.16)	8.38** (4.18)	-35.9*** (6.14)	-24.8** (10.25)
Time to maturity at issue (*MATURITY$_{it}$*)	2.23 (1.47)	2.23 (1.85)	2.23 (1.82)	2.05 (1.49)	1.33 (1.81)	2.32 (2.18)	0.249 (2.19)	7.235*** (1.31)	15.0*** (2.60)	12.2*** (2.60)
Sovereign CDS (*SOV$_i$*)	0.0600 (0.0451)	0.0598 (0.0613)	0.0598 (0.0684)	0.0440 (0.0456)	0.094* (0.0496)	0.158*** (0.0585)	0.099* (0.0586)	0.190*** (0.0633)	0.0843 (0.0614)	-0.0736 (0.0975)
Issuance volume (*LIQUID$_i$*)	-9.70e9*** (2.70e09)	-9.70e-09*** (2.79e-09)	-9.70e-09*** (3.04e-09)	-9.91e-09*** (2.73e-09)	-6.52e-09* (3.41e-09)	-8.41e-09** (3.47e-09)	-9.03e-09** (3.50e-09)	-1.53e-08*** (2.25e-09)	-1.24e-9 (2.26e-9)	-2.59e-8*** (2.31e-09)
Private placement (*PRIVATE$_i$*)	-1.66 (5.42)			-1.77 (5.53)	13.79 (13.94)	3.48 (8.85)	-0.340 (9.09)	7.269 (5.31)	24.8 (4.62)	1.49 (4.84)
Volatility (*VOL$_{it}$*)	0.651** (0.298)	0.651 (0.527)	0.651** (0.242)	0.642** (0.302)	0.614 (0.374)	-0.175 (1.540)	0.312 (0.485)	0.684 (0.429)	0.140 (1.28)	0.793 (0.504)
USD-denominated (*CURRENCY-USD$_i$*)	3.95 (4.09)	3.95 (5.14)	3.95 (6.40)	4.11 (4.14)	-21.02** (9.22)	-4.31 (5.81)	-5.75 (5.87)	4.823 (3.61)	-14.3*** (5.03)	1.68 (4.59)

Table 13: Robustness and sensitivity of estimation results of indirect effects model

Variable	Main estimation model (Table 11)	Alternative estimation models								
		Alternative standard errors		Alternative dependent variables		Additional controls		Alternative weights (sensitivity of empirical strategy)		
		Clustered SEs (by month)	Clustered SEs (by country)	Alternative pricing source	Exchange rate premia-adjusted	Addition of time dummies	Addition of bond clauses	SG issuance volume by month of issue	SG issuance volume by country of risk	Combined alternative weights
Non-EUR- and non-USD-denominated ($CURRENCY\text{-}OTHER_i$)	7.08 (4.65)	7.08 (5.23)	7.08 (9.66)	7.22 (4.71)	-49.54*** (11.85)	3.80 (6.60)	4.25 (6.68)	19.51*** (4.44)	13.2*** (5.07)	35.8*** (5.46)
Variable interest rate ($COUPON\text{-}VARIABLE_i$)	-26.7*** (5.10)	-26.7*** (8.72)	-26.7*** (7.23)	-27.98*** (5.19)	-28.12*** (6.67)	-20.96*** (6.81)	-19.85*** (6.80)	-45.66*** (4.91)	-18.8*** (5.33)	-78.2*** (5.87)
Additional controls (not displayed)										
Country of risk ($COUNTRY_i$)	Y	Y	Y	Y	Y	Y	Y	Y	N	Y
Month of issue dummies (T_i)	N	N	N	N	N	Y	Y	N	Y	N
Bond clauses ($CROSS_i$, $NEGATIVE_i$, $FORCE_i$)	N	N	N	N	N	N	Y	N	N	N
Weights										
Selection correction – volume of SG issues by month	N	N	N	N	N	N	N	N	Y	Y
Selection correction – volume of SG issues by country	N	N	N	N	N	N	N	Y	N	Y
Number of observations	*647*	*647*	*647*	*646*	*388*	*352*	*352*	*614*		*540*
Adjusted-R^2	*0.50*	*0.52*	*0.52*	*0.50*	*0.57*	*0.54*	*0.49*	*0.61*		*0.53*

Note: SE (standard error), - (omitted)
* p<.1 ** p<.05 *** p<.01

3.6.6 Summary of the econometric analysis

The key findings of the econometric assessment of the impact of the existence of a state guarantee on the bonds issuance costs are the following:

- Bond issuance costs of SG bonds are, on average, 33.4bps lower than in absence of the guarantee.
- The empirical result that the presence of a state guarantee reduces issuance costs is robust across a number of models and variable specifications. But, the estimated magnitude of the average impacts varies somewhat, ranging from 18 bps to 57 bps.
- The distribution of the impacts varies more widely still. SG bonds with median issuing costs or below do not show state guarantees having a statistically significant impact on their issuing costs. Meanwhile, SG bonds with above (median) average issuing costs saw impacts in the range of 63.7bps to 164bps.
- Moreover, we noted a ratings upgrade effect insofar as state guarantees had a sizeable statistically significant impact on the issuing costs of bonds rated BBB-/BBB/BBB+, in the order of over 200bps.
- While each individual SG bond issue benefited from the state guarantee through a lower issue cost, all bond issues (SG and non-SG) were impacted negatively by the overall volume of SG bond issues during a month. Each bond issue faced a higher issuance cost of 0.04bps for each tranche of €1billion in SG bonds issued during the month. On average, this amounted to raising issuing costs by 10.5bps.
- Moreover, this negative impact is higher for non-SG bonds issued by banks which did not participate in the scheme (0.08 bps for each tranche of €1billion in SG bonds issued) than for bonds (SG and non-SG) issued by participating banks. In the case of the latter, only SG bond issues were impacted.
- This indirect effect is entirely domestic as the monthly volume of SG bond issues outside a Member State is not found to impact on the issuance cost of SG and non-SG bonds in the domestic market.

4 Impact of state guaranteed bonds on bank lending, funding and profitability performance

4.1 Introduction

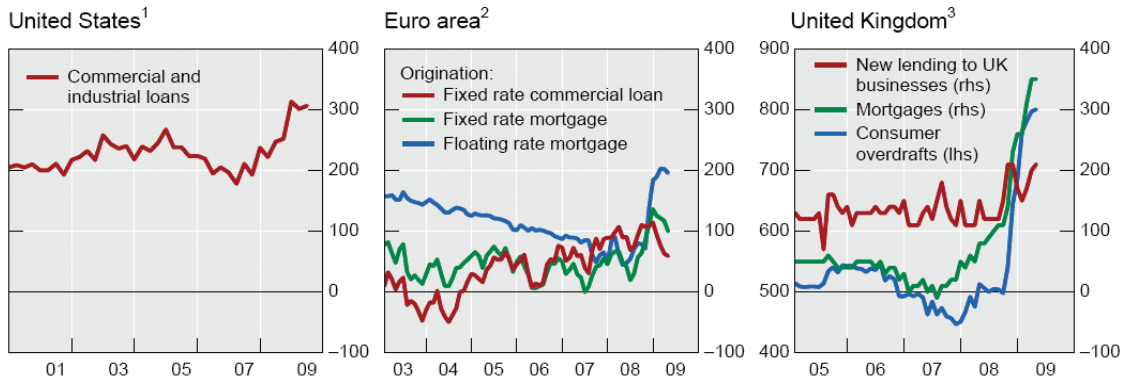
This study also provides evidence regarding the impact of state guarantees on the lending, risk-taking and other behaviours of banks, through an analysis of balance sheet variables.

Previous studies have made some observations about developments in bank outcomes, particularly relating to lending conditions (e.g. IMF, 2009 and Panetta et al., 2009) and we reflect on these below.

One aspect of lending conditions evaluated over this period by previous studies was developments in interest rate spreads. Figure 19, for example, shows interest rate spreads up to 2009 for different types of loans for the Euro area and the UK, as well as the United States for comparative purposes.

We see that interest rate spreads rose sharply on all types of consumer and commercial loans in autumn 2008. In the Euro area and to some extent in the United Kingdom, this trend turned around at the outset of 2009. However, interest rate spreads were still comparatively large compared to historical levels.

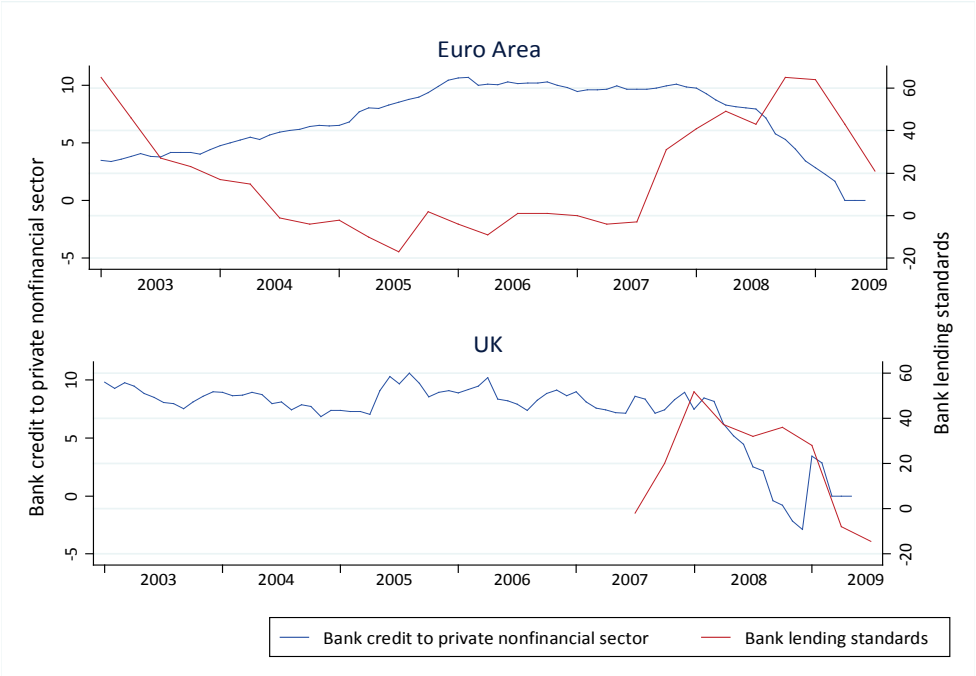
Figure 19: Interest rate spreads on bank loans, bps



Note: [1] Spread of commercial and industrial loan rates over intended federal funds rate. [2] For fixed rate (floating rate) loans, spreads are computed over the 10-year swap rate (three-month Euribor rate). [3] Spreads over Bank rate.
Source: Panetta et al. (2009): national data

Another focus of previous studies has been developments in bank lending itself. Figure 20 tells a story consistent with Figure 19. That is, reflecting high interest rate spreads growth in bank lending to the private nonfinancial sector decelerated in the Euro area and the UK following the start of the financial crisis in late 2007. And, by May 2009, the growth rate was close to zero in both.

Figure 20: Credit growth and bank lending standards



Note: [1]Bank lending standards (net percentage change, a positive number indicates tightening of standards. Net percentage change refers to the difference between the percentage of banks that tightened standards and the percentage of banks that eased standards.)
[2]Bank credit to private nonfinancial sector (year-on-year percent changes through June 2009.)
Source: IMF (2009): Haver Analytics and national sources

However, Figure 20 also shows that despite a tightening of credit conditions, lending standards of banks in the Euro area and the UK were loosening by the end of 2008, which is consistent with banks seeking to extend more loans than they previously were.

The present study analyses trends in lending and other balance sheet variables in greater detail. Firstly, through consideration of the period October 2008 to December 2010, which includes more recent data than was available at the time of previous studies, we are able to analyse responses of balance sheet variables to state guarantees that may be emerging with a time lag.

Secondly, by focusing on individual bank data as opposed to aggregates, we distinguish developments in the balance sheets of banks participating and not participating in state guarantee schemes.

And thirdly, we use a difference-in-differences framework that allows us to isolate the impact of state guarantees and control for other policies and changes in market conditions that may have affected both participating and non-participating banks.

The following sections present an analysis of the effects state guarantees on bank lending, leverage and profitability.

Section 4.3 provides a descriptive analysis of the impact of the issue of guaranteed bonds on banks' performance.

Section 4.4 presents the statistical methodology generically, as applied to credit extension.

Sections 4.4.2-4.4.3 present the estimation results of the impact of state guarantees on bank lending and leverage.

Section 4.5 provides conclusions.

We begin with a description of data and measurement below.

4.2 Data and measurement

As per chapter 3, two sources were used to collect information at the bond-level, bank-level and wholesale funding market-level:

- **BankScope®** provided bank-level data, including financial statements, ratings and other information for *listed and non-listed* banks. Bank data were collected in order to analyse the impact of the issuance of SG bonds on bank performance, credit extension and access to wholesale funding, among other bank outcomes.

- **Bloomberg®** provided bond- and market-level data, and complemented BankScope with bank-level data for listed banks. Bond-level data were gathered to measure bond issuing costs and their determinants. And, market-level data were collected to provide market-level information on factors influencing bank outcomes and bond issuing costs.

In addition to the main data sources used, information contained in various central bank, government and other reports were used to compile a database of the features of state guarantee schemes. The primary use for this database was to identify non-SG bonds that would have been eligible for a state guarantee to form the counterfactual group of banks or comparison group against which to compare the performance of banks having issued SG bonds.

In short the control group consists of banks that were eligible to issue SG bonds but did not do so why the "treated" group consists of banks that issued SG bonds. Using as a control group the banks that could have issued SG bonds rather than the whole population of banks that did not issue SG bonds is more appropriate to assess the impact of issuing bonds and any relative competitive advantage that may have arisen as a result of the issue of SG bonds "Treated" and control group differ mainly in that one group benefited from a "treatment", namely the guarantee of their bond issues.

The remainder of this section considers bank data and measurement in depth in relation to bank outcomes.

4.2.1 Bank outcomes

For the study of the impact of state guarantees on bank performance, the following key bank outcomes are considered: (i) credit extension, (ii) funding outcomes, (iii) bank performance and (iv) leverage. The variables chosen for this analysis are summarised in Table 14.[16]

[16] We note at this stage that the use of balance sheet variables proxies for the underlying economic concepts of interest.

Table 14: Summary of bank outcome variables

Outcome	BankScope name	Summary
Bank credit extension	Net Loans[1]	Total value of outstanding loans as reported on the balance sheet. Net Loans is an aggregate value of: • Residential Mortgage Loans • Other Mortgage Loans • Other Consumer/Retail Loans • Corporate & Commercial Loans • Other Loans Less: Reserves for Impaired Loans/NPLs
Bank access to funding	Total Liabilities and Equity	Total value of liabilities and shareholder's equity as reported on the balance sheet.
	Total deposits and short-term funding	Deposits and short-term funding includes: • Customer Deposits • Deposits from Banks • Repos and Cash Collateral Other Deposits and Short-term Borrowings
	Total long-term funding	Includes Senior Debt Maturing after 1 Year + Subordinated borrowing + Other funding
Bank performance	Net interest income	Includes Gross interest and dividend income - Total interest expense
	Operating income	
Leverage	1-(Total equity/Total assets)	
	Tier 1 Capital ratio	This measure of capital adequacy measures Tier 1 capital. That is shareholder funds plus perpetual non cumulative preference shares as a percentage of risk weighted assets and off balance sheet risks measured under the Basel rules. This figure should be at least 4%.

Note: [1]Disaggregated loan data are generally missing. For this reason, we focus on the aggregate loan variable.
Source: BankScope

4.2.2 Determinants of bank outcomes

The potential explanatory for the study of the effect of state guarantees on bank outcomes are sourced from several databases.

In general, these explanatory variables can be placed in three groups which capture policy effects, banking sector effects, and bank-specific effects, respectively.

The policy effects are captured by variables created using information on bonds issued, as downloaded from Bloomberg.

The banking sector effects are added to the analysis through variables that are downloaded from Bloomberg or Eurostat.

And, the bank-specific effects are captured by variables from BankScope.

Policy variables

Using the Bloomberg dataset on bond issues, three variables at the bank-level are generated and used.

$GUARANTEED_{it}$ is a dummy variable indicating whether bank i participated in a state guarantee scheme or received an *ad hoc* guarantee. $GUARANTEED_{it}$ is coded as one in the first year in which an SG bond was issued and thereafter and 0 otherwise. $GUARANTEED_{it}$ is the main variable of interest in terms of determining the impact of state guarantees to banks on credit extension.

$GUARANTEE\ YEAR_{it}$ is a dummy variable set to 1 in the first year a bank issued a state guarantee and 0 otherwise. This variable is included in order to isolate values of bank outcomes in the year of participation in a state guarantee scheme from pre- and post- values captured through $GUARANTEED_{it}$.

$GUARANTEE\ SIZE_{it}$ is the ratio of the value of bonds issued under state guarantee by bank i in year t to Total Liabilities and Equity in year t. The value of guarantees is scaled in order to ensure comparable values across banks.

Banking sector variables

VOL_t is the volatility of the EURO STOXX 50 option prices, known as VSTOXX Index. It is used as a measure of market expectations of near-term up to long-term volatility. High values are associated with lower credit extension.

GDP_{jt} is the real gross domestic product per capita in country j in year t from the Eurostat database. Real GDP is a driver of demand for loans. Therefore, changes in real GDP are associated with changes in credit extension, *ceteris paribus*.

$INTEREST\ RATE\ (LONG\text{-}TERM)_{jt}$ is the interest rate on 10-year government bonds issued by country j in year t. The long-term interest rate is used as a proxy for the interest rate which drives the demand for loans.

INTEREST RATE (SHORT-TERM)$_{jt}$ is the interest rate set by the central bank in country j in year t. It is used an indicator of the costs to banks of central bank funds.

INTERBANK RATE$_{jt}$ is the rate affecting the cost of funds for banks and in turn their supply of credit. The chosen interbank rate is the 1-month EURIBOR.

Bank specific variables

BANK RATING$_{it}$ is the rating assigned by Fitch Ratings to bank i in year t. The rating reflects the bank's perceived ability to make timely payments on loan obligations. The variable is a dummy variable taking the value 1 if bank i is assigned "AAA"-grade in year t and "0" otherwise. A rating of "AAA" is assigned to banks whose capacity for timely payments is adjudged to be extremely high.

RESERVES$_{it}$ is the ratio of reserves for impaired loans held by bank i to bank i's total liabilities and equity.

TOTAL ASSETS$_{it}$ is the total value of earning assets owned by bank i in year t. The variable is the sum of loans, securities, insurance assets, other assets and property.

Table 15: Variables used in the analysis of bank outcomes

Group	Variable(s)	Description	Source
Policy variables			
Guaranteed	$GUARANTEED_{it}$	Dummy variable indicating whether bank i participated in the scheme before or in year t.	Based on bond issue data from Bloomberg.
Year of guarantee	$GUARANTEE\ YEAR_{it}$	Dummy variable indicating whether bank i participated in the scheme in year t	Based on bond issue data from Bloomberg.
Size of guarantee	$GUARANTEE\ SIZE_{it}$	The value of state guaranteed bonds issued by bank i in year t. The value is expressed as the proportion of Total Liabilities and Equity at the end of year t.	Based on bond issue data from Bloomberg.
Banking sector effects			
Real GDP	GDP_{jt}	GDP per capita, standardised using the Purchasing Power Parity.	Eurostat
Long term interest rate	$INTEREST\ RATE\ (LONG\text{-}TERM)_{jt}$	The interest rate on a 10 year government bond in the bank's home country.	Bloomberg
Central bank interest rate	$INTEREST\ RATE\ (SHORT\text{-}TERM)_{jt}$		Eurostat
V2X	VOL_t	VSTOXX is a measure of market expectations in the near-term up to long-term volatility. The basis is the volatility of the Euro Stoxx 50 option prices. High VSTOXX implies expectations of high volatility in the market.	Bloomberg
1-month Interbank rate, Euribor	$INTERBANK\ RATE_{jt}$		Bloomberg
Bank specific effects			
Fitch rating on long-term debt	$BANK\ RATING_{it}$	Dummy variable taking the value 1 if bank i was rated "AAA" by Fitch and "0" otherwise	BankScope
Reserves for impaired loans	$RESERVES_{it}$	The reserves set aside for impaired (non-performing) loans by bank i in year t, expressed as a proportion of Total Liabilities and Equity.	BankScope
Total earning assets	$TOTAL\ ASSETS_{it}$	Total earning assets including Net Loans, Loans and Advances to Banks, Total Securities, Insurance Assets, Other Earning Assets and Investments in Property.	BankScope

Currency considerations

Bloomberg data

Bloomberg report the value of a bond in the currency at which the bond is issued. Using monthly exchange rates obtained from the European Central Bank the values have all been converted to Euros.

The remaining data from Bloomberg is reported in percentages or ratios, so there are no currency considerations associated with those data.

BankScope data

BankScope convert all values from the currency in which the annual report is filed into U.S. dollars using exchange rate data from the International Monetary Fund. BankScope use the prevailing exchange rate on the nearest date to the date of the close of the reports.

For the purpose of this study, the dollar-values have been converted to Euros using average annual exchange rates obtained from the European Central Bank.

Eurostat data

Eurostat provide central bank interest rate, which is measured in percentages, and real GDP per capita, which is standardised using the Purchasing Power Parity. Thus, there is no need to exchange rate adjust the Eurostat data.

Data frequency

Bankscope provides data at the quarterly level whenever it is available, and as this is the desired data frequency, such data was reviewed.

Unfortunately, data at the quarterly level is scarce. Of a total of 213 state guaranteed and comparison banks, an average of 32 observations was available per variable per quarter. Due to this, the analysis of bank outcomes uses annual data, which consists of an average of 140 observations per variable per year. Annex 6 provides details of data availability at the quarterly and annual data.

4.3 Descriptive analysis of the impact of the issue of guaranteed bonds on banks' performance

This section provides a brief analysis of the performance of banks having benefitted from a guaranteed bond issues relative to banks which issued non-guaranteed bonds that would have qualified for the guarantee schemes.

The sample of EU27 banks comprises 142 banks which, over the period 2008-2011, either issued only guaranteed bonds or a mixture of guaranteed and non-guaranteed bonds which would have qualified for a guarantee. In addition, there are 71 banks which did only issue non-guaranteed bonds which would have qualified for a guarantee.

In order to compare the performance of the two types of banks, the descriptive analysis below focuses on the change in a number of key balance sheet items one year after the issue of the state guaranteed bonds relative to the year immediately preceding the issue of the guaranteed bond.

The following balance sheet items are considered in the analysis below:

Assets

- net loans[17]

Liabilities

- total deposits and short-term funding
- total long-term funding
- total liabilities and equity

The data used in the analysis and their source are described above.

Unfortunately, the analysis of the changes in the balance sheet items has to be limited to the items listed above as detailed information on the various types of loans on the asset side and deposits on the liability side is missing for an overwhelming majority of the banks in our sample.

In addition, a comparison of the profit performance of the two bank groups following the issue of guaranteed bonds is also undertaken below. To that end, two different profit indicators are used, namely a) the ratio of net interest income to total liabilities and equity, and b) the ratio of operating income to total liabilities and equity.

As data are only available annually for the majority of the banks in our sample, changes between end-year figures are used when the performance of banks is measured at the level of the balance sheet and changes between annual figures are used when the focus of the analysis is profitability.

The basic idea underlying the post-issue period /pre-issue period comparison is that the full impact of the issue on either the asset or the liability side of the balance sheet is likely to take some time to materialise. For the purpose of the analysis we assume that this adjustment lag is at a minimum 3 quarters.

If quarterly data were available, it would be easy to compute the change in a balance sheet item between the end of quarter t+3 and the end of quarter t-1 with quarter t being the quarter of the issue of the guaranteed bonds.

With annual data, the definition of the pre- and post-issue periods is somewhat less precise as the lag between the post-issue period and the issue period, when measured in terms of quarters, unavoidably varies depending on the issue quarter.

[17] Net loans includes Residential Mortgage Loans + Other Mortgage Loans + Other Consumer/ Retail Loans + Corporate & Commercial Loans + Other Loans-Reserve against possible losses on impaired or non performing loans

For example, for an issue in the first quarter of a given year, say 2009, the post-issue period will be end of 2009 and the pre-issue period will be end of 2008.

In contrast, for an issue during the second, third or fourth quarter, the post-issue period will be end of 2010 and the pre-issue period will be end of 2008.

To take account of the fact that a number of banks proceeded with several guaranteed bond issues from 2007 to 2010, the analysis below uses as the post-issue period the period which follows the last issue of guaranteed bonds by a minimum 3 quarters.

The lag of minimum three quarters is a trade-off between accessible data, finishing essentially in 2010 on the one hand and the desire to exclude information pertaining to abnormal situations, i.e. the period when the state guarantee was issued on the other hand. As state guarantees were (in our context at least) offered to all banks, the decision to accept the offer is likely endogenous to the financials of a bank, the very financials we want to estimate the differences in. Therefore, including periods too close to the intervention would bias the results.

If quarterly data were available, the ideal approach would be to simplify this approach by defining pre-issue period as one year before the issue and post-issue as one year after the issue? This change would also simplify interpretation of results. Unfortunately, as only annual data are available, the approach adopted in the present study defines the pre-issue year such that the elapsed time before the issue of the SG bonds is strictly less than 12 months, and the post-issue year such that the elapsed time from the date of the DG bonds is strictly greater than 9 months. Due to the above considerations, this definition is the best possible outcome. The suggested approach does exactly make sure that the entire analysis is performed over three years

The analysis of contemporaneous effects offers the requested results when honouring the data limitations.

The table below shows the distribution of the 142 banks across the various pairs of potential pre-issue/post-issue years.

As can been seen in the table below, the most common pairs of pre/post issue years are 2008/2010 and 2010/2011.

As the 2011 end-year figures are not yet available, the descriptive analysis in the present section considers only the pre/post issue year pairs shown in bold in the table and covers 58 banks out of the 142 banks having brought to market one or several guaranteed bond issues from 2008 to 2010.

As the analysis focuses on the differences in outcomes over an identical period and not on differences in outcomes over different pre- and post intervention periods, the data in Tables 17 and 18 show the cumulative change over the period and not then annualised average change.

Table 16: Distribution of banks by pre-issue and post-issue reference periods			
Pre-issue year	**Post-issue year**	**Number of banks**	**Percentage**
2007	2008	0	0
2007	**2009**	**2**	**1.4%**
2007	**2010**	**7**	**4.9%**
2007	2011	4	2.8%
2008	**2009**	**6**	**4.2%**
2008	**2010**	**41**	**28.9%**
2008	2011	28	19.7%
2009	**2010**	**2**	**1.4%**
2010	2011	52	36.6%
Total		142	100%

Source: London Economics

In order to compare the evolution of the balance sheet items of banks having issued guaranteed bonds and having issued non-guaranteed bonds eligible for the guarantee, the analysis focuses on banks having issued guaranteed bonds only in the last 3 quarters of 2009 as this is the largest group of banks in our sample for which the data required for the analysis are available. Data for other years are reported as well but 2009 is the year with largest SG and non-SG bond issues and thus any differences in average outcomes in 2010 is less likely to be driven by one or other particular bond issue/bank.

The two tables overleaf show that, on average:

- banks having issued guaranteed bonds increased their net loan book by less than banks having issued non-guaranteed bonds that would have been eligible;
- however, these banks increased their short-term and long-term funding by more than banks having issued non-guaranteed bonds and their equity capital by less;
- moreover, the banks having issued guaranteed bonds show a worse post-issue profit performance (measured either by ratio of net interest income to total liabilities and equity or operating income to total liabilities and equity)

Two caveats should be noted at this stage.

- First, for data reasons, the descriptive analysis focuses on the effect of the 2009 guaranteed bonds issues. It is possible that the issues in 2008 or 2010 may be associated with different post-issue impacts
- Second, the standard deviations around the average change in the various balance sheet items of interest is very large for both the banks having issued guaranteed bonds and the banks having issued noon-guaranteed bonds that would have been eligible. This suggests that both groups are highly heterogeneous and other factors may explain differences in observed changes in the various assets and liabilities.

These two observations suggest that a more extensive, multi-variate, econometric analysis is required to be able to the separate the impact of the guarantee from the contribution of other factors. This is the focus of the next section.

Table 17: Difference in asset and liability growth between banks having issued guaranteed bonds and banks having issued eligible bonds without guarantee

Balance sheet item	Pre-issue year	Posts- issue year	Banks having issued guaranteed bonds			Banks having issued eligible bonds without guarantee		
			Number of banks	Mean of % change	Standard deviation of % change	Number of banks	Mean of % change	Standard deviation of % change
Net loans (% change)								
	2007	2009	2	1.4%	13.8	63	4.6%	18.3
	2007	2010	6	-16.5%	18.5	58	12.4	30.1
	2008	2009	6	7.1%	4.1	65	8.9%	15.4
	2008	**2010**	**27**	**9.5%**	**26.5**	**59**	**16.2%**	**22.6**
	2009	2010	2	-6.4%	6.7	59	4.4%	13.8
Total deposits and other short-term funding								
	2007	2009	2	-1.8%	5.0	58	5.7%	26.7
	2007	2010	6	-3.0%	31.3	57	0.7%	19.4
	2008	2009	6	3.6%	11.3	61	8.7	15.8
	2008	**2010**	**26**	**11.9%**	**24.2**	**55**	**9.5%**	**24.2**
	2009	2010	2	-6.7%	11.5	59	0.55	20.2
Total long-term funding								
	2007	2009	2	26.4%	31.6	65	-7.1	33.7
	2007	2010	6	-36.6%	22.4	58	8.2	86.4
	2008	2009	5	20.5%	24.5	65	2.4%	31.7
	2008	**2010**	**21**	**8.5%**	**36.4**	**57**	**6.6%**	**37.3**
	2009	2010	2	8.9%	27.1	55	-1.4%	24.6
Total liabilities + equity								
	2007	2009	2	5.0%	27.2	65	7.6%	26.8
	2007	2010	6	6.1%	36.5	58	14.5%	27.9
	2008	2009	5	40.9%	16.5	65	24.7%	21.8
	2008	**2010**	**24**	**16.7%**	**37.3**	**57**	**32.5%**	**24.8**
	2009	2010	2	2.6%	4.1	59	6.5&	14.3

Source: London Economics

Table 18: Difference in profit performance between banks having issued guaranteed bonds and banks having issued eligible bonds without guarantee

Balance sheet item	Pre-issue year	Posts- issue year	Banks having issued guaranteed bonds			Banks having issued eligible bonds without guarantee		
			Number of banks	Mean of % change	Standard deviation of % change	Number of banks	Mean of % change	Standard deviation of % change
Net interest income / total liabilities + equity (% change)								
	2007	2009	1	-30.9%	-	63	12.5%	30.5
	2007	2010	6	-3.6%	34.4	58	12.4%	30.1
	2008	2009	6	2.3%	29.8	65	10.6%	25.1
	2008	**2010**	**26**	**-11.2%**	**25.2**	**58**	**9.8%**	**26.0**
	2009	2010	2	-6.5%	4.9	59	0.8%	19.1
Operating income / total liabilities + equity (% change)								
	2007	2009	1	-11.6	-	62	1.9%	25.5
	2007	2010	6	-1.4	22.1	58	9.8%	26.0
	2008	2009	5	5.0%	17.6	57	12.7%	27.6
	2008	**2010**	**24**	**-1.4%**	**30.7**	**51**	**13.6%**	**26.9**
	2009	2010	2	-1.1%	4.5	58	-0.9%	17.3

Source: London Economics

4.4 Econometric analysis of the impact of the issue of guaranteed bonds on banks' performance

4.4.1 Empirical research strategy

The empirical research strategy adopted for the assessment of the impact of state guaranteed bonds on bank outcomes is the counterfactual approach whereby the performance of a relevant control group of banks that did not participate in state guarantee schemes or receive *ad hoc* guarantees ('non-participating' banks) is compared to the performance of banks that did not participate in state guarantee schemes or received *ad hoc* guarantees ('participating' banks).

The bank sample used in the analysis consists of participating and non-participating banks that *issued bonds that were, or would have been eligible to be, state guaranteed*. That is, bank selection is based on the issuers behind the SG and non-SG bonds considered in Section 2.

The *average impact* of a state guarantee on bank outcomes is estimated by taking the difference-in-differences of bank outcomes of participating and non-participating banks, controlling for other determinants of bank outcomes that are observed and can be measured.

Estimating the difference-in-differences involves several steps. Below, we provide an illustration based on 2 banks only, a participating bank and a non-participating bank.

Firstly, for participating banks, the difference in bank outcomes is considered pre- and post-participation. For instance, Swedbank AB received state guarantees over 2008 and 2009. In 2007, pre-participation, it extended €129m of credit based in net loans. And in 2010, post-participation, it extended €133m of credit. Therefore, the difference in credit extension for Swedbank was €4m.

Secondly, for non-participating banks, the difference in banks outcomes is considered over the same time period as for participating banks. For example, for apoBank AG, the difference in net loans between 2008 and 2010 was €0.33m.

Finally, the difference-in-differences of net loans for participating and non-participating banks are compared. For Swedbank AB and apoBank AG, their difference-in-differences of net loans was €3.67m.

The benefit of the difference-in-differences approach is that many unobservable and/or non-measurable differences that affect participating and non-participating bank outcomes are controlled for.

Differences in bank characteristics that affect bank outcomes are taken into account through considering differences in bank outcomes over time. For instance, size, e.g., in terms of a strong local deposit base, may explain a large proportion of the difference in the level of credit (i.e., the stock of loans) extended by Swedbank AB and apoBank AG. However, it is unlikely to explain much of the *change* in credit extension undertaken by Swedbank AB and apoBank AG over 2008 and 2010.[18]

Additionally, by considering participating and non-participating banks over the same time period, economic conditions affecting both groups equally are accounted for. For instance, the banking sector may have experienced a post-financial crisis recovery in 2010 leading to improved bank outcomes for all banks. Continuing with the example of Swedbank AB and apoBank AG, net loans may have grown by an average of €0.2m for both banks due to the recovery effect. Given other determinants of bank outcomes that are observed and can be measured, which may amount to €3m, the outstanding difference-in-differences of €0.67m (€4m - €3m - €0.33m) can therefore be viewed as the average impact of a state guarantee on bank outcomes in our sample of 2 banks.

The outstanding concern regarding the difference-in-differences approach is the impact of time-varying factors on the difference-in-differences of bank outcomes. For instance, in terms of our example above, if Swedbank AB grew more than apoBank AG over the period 2008-2010 then part of the €0.67m difference-in-differences in net loans would be due to this change in relative size instead of use/non-use of state guarantees. To account for changes in size, the main difference-in-differences results are re-estimated with interactions between independent variables and bank outcome variables.

Finally, the limitation of the difference-in-differences approach is the impact of time-varying factors that influence difference-in-differences of bank outcomes that are unobserved or unaccounted for.

[18] Moreover, to account for size explicitly, we also consider difference-in-differences in percentage terms. That is, a €4m expansion in credit extension for Swedbank AB represents a 3.1% increase and a €0.33m expansion in credit extension for apoBank AG represents a 1.4% increase, and therefore a difference-in-differences of 1.7%.

Bank selection

For the analysis of the impact of state guarantees on bank performance, only banks that issued bonds that were, or would have been eligible to be, state guaranteed are included. Therefore, the basis of the dataset of bank performance variables is the dataset of bond issues obtained via Bloomberg. In other words, all issuers behind the dataset of bond issues are included in the analysis of bank outcomes.

Table 19 shows the number of banks issuing 0, 1, 2-4, and 5 bonds or more with a state guarantee. The table shows that the majority of banks that issued state guaranteed bond(s) issued a small number of those.

Detailed information on the process followed for the selection of banks is presented in Annex 6.

Table 19: Overall bank issuing activity by year of take-up of state guarantee and number of issues

	No state guarantee		State guarantee							
			1 bond		2-4 bonds		5+ bonds		Total	
Year	No. banks	Share	No. banks	Share	No. banks	Share	No. banks	Share	No. banks	Share
2008	21	61.76%	4	11.76%	3	8.82%	6	17.65%	34	100%
2009	125	59.52%	26	12.38%	39	18.57%	20	9.52%	210	100%
2010	108	54.54%	37	18.69%	40	20.20%	13	6.57%	198	100%
Total	71	33.33%	42	19.72%	56	26.92%	44	20.66%	213	100%

Source: Bloomberg and BankScope

Main empirical specification

The main empirical specification considered is based on the following fixed effects model for participating and non-participating banks over the period 2005-2010.

$$\Delta\ OUTCOME_{it} = \beta_1\ GUARANTEED_{it} + \beta_2\ GUARANTEE\ YEAR_{it} + \boldsymbol{\gamma\ CONTROLS_{it}} + \boldsymbol{\delta\ T_t} + \boldsymbol{\lambda\ T_t}*\boldsymbol{COUNTRY_i} + v_i + \varepsilon_{it} \quad (6)$$

For each bank, i, in year, t:

- $OUTCOME_{it}$ is the bank outcome of interest[19]
- $GUARANTEED_{it}$ is whether or not the bank participated in a state guarantee scheme
- $GUARANTEE\ SIZE_{it}$ is the total volume of SG bonds issue by the bank expressed as a proportion of total liabilities + equity
- $GUARANTEE\ YEAR_{it}$ indicates the first year in which the bank participated in a state guarantee scheme

[19] Depending on the precise specification, this may be differences in the outcome of interest or logged differences with particularly independent variables also affected.

- $\boldsymbol{CONTROLS_{it}}$ is a vector of controls that affect the bank outcome of interest
- $\boldsymbol{T_t}$ is a vector of time dummies
- $\boldsymbol{COUNTRY_i}$ is a vector of country dummies
- $\boldsymbol{T_t}$*$\boldsymbol{COUNTRY_i}$ is a vector of country-time interaction effects
- v_i is a bank-specific error term
- ε_{it} is an idiosyncratic error term

This model accounts for time-constant unobserved heterogeneity due to bank-specific differences.

Additionally, the main empirical specification controls for year of participation dummies (*GUARANTEE YEAR*$_{it}$), time and country dummies ($\boldsymbol{T_t}$, $\boldsymbol{COUNTRY_i}$ and $\boldsymbol{T_t}$*$\boldsymbol{COUNTRY_i}$) and bank- and macro-level controls ($\boldsymbol{CONTROLS_{it}}$).

The motivation for including these sets of variables is to control for unobservable, partially observable and observable factors driving the bank outcome of interest (as described intuitively in Section 2).

Specifically, year of participation dummies account for factors systematically affecting participating banks in the years in which they issued SG bonds. This captures features such as economic conditions leading to severe losses, participation in state guarantee schemes and other financial rescue programmes, etc.

Time dummies take into account time trends and country dummies take into account Member State-specific variation. This relates to factors influencing all banks in a given year/country such as inflation, unemployment, interest rates and other macroeconomic and banking sector conditions.

Due to the connectedness of the banking sector, there is a distinct possibility of observing contagion through the period as a result of shocks propagating across Member States. To account for this possibility, time and country interactions are included in the main empirical specification.

Bank- and macro-level controls are specifically included to take into account any variation in these variables not taken into account through the year of participation and time dummies.

GUARANTEE YEAR$_{it}$ is a variable used to capture the fact that the first year following the issue of the SG bonds may not fully reflect their impact.

The estimated coefficients of the *GUARANTEED*$_{it}$ and *GUARANTEE SIZE*$_{it}$ variables are the coefficients of interest as they reflect the estimated impact of state guarantees given to bank bond issues on bank outcomes.

Estimation issues

Endogeneity of state guarantees

Endogeneity of the existence of state guarantees of bank bond issues is a key concern as it would lead to biased estimates of the parameter of interest (*GUARANTEED*$_{it\ of}$ or *GUARANTEE SIZE*$_{it}$). Such endogeneity may arise if bank outcomes encouraged the development of state guarantee schemes.

However, theoretically, the design of state guarantee schemes is likely to have been independent of the circumstances of any *particular* bank. And, both participating and non-participating banks could opt into a state guarantee scheme if they wished to do so.

Moreover, empirically, one observes that participation in a state guarantee scheme is relatively uncorrelated with bank outcomes as show in Annex A8.1.

Where appropriate, the variables $GUARANTEED_{it-1}$ *or* $GUARANTEE\ SIZE_{it}$ are entered with a lag in the model to be estimated to alleviate outstanding endogeneity concerns.

Moreover, the model to be estimated focuses on *changes* in the outcomes of interest as opposed to the *stock* of outcomes of interest. The use of the stock figures would reflect a mixture of pre- and post-state guaranteed outcomes and lead to larger endogeneity concerns.

Autocorrelation of bank outcomes

One of the assumptions of applying the fixed effects model on multi-period panel data is that error terms across observations should be uncorrelated (i.e., no autocorrelation).

However, bank outcomes are generally highly autocorrelated year-on-year. This is shown in Annex 6.

In the presence of autocorrelation of bank outcomes the use of cluster-robust (or Huber-White sandwich) standard errors is appropriate. This allows for heteroscedasticity and autocorrelation over time for a given bank and ensures that estimated standard errors are not biased.

Contemporaneous correlation of bank outcomes

Contemporaneous correlation of bank outcomes is also likely to be present through banking sector and wholesale funding competition effects on bank outcomes. To account for this, our preferred estimation method involves Driscoll-Kraay standard errors that take both autocorrelation and contemporaneous correlation into account in the estimation of standard errors.

Attrition

Attrition resulting from bankruptcy or mergers and acquisitions activity is present in the data. Moreover, attrition may come about due to differences in reporting requirements across banks, especially for the latest year of data. However, the attrition process is correlated with bank-specific characteristics, v_i, which do not bias the fixed effects estimates. As such, the main empirical specification is robust to attrition bias insofar as it does not occur in an idiosyncratic manner.

4.4.2 Impact of state guarantees on lending

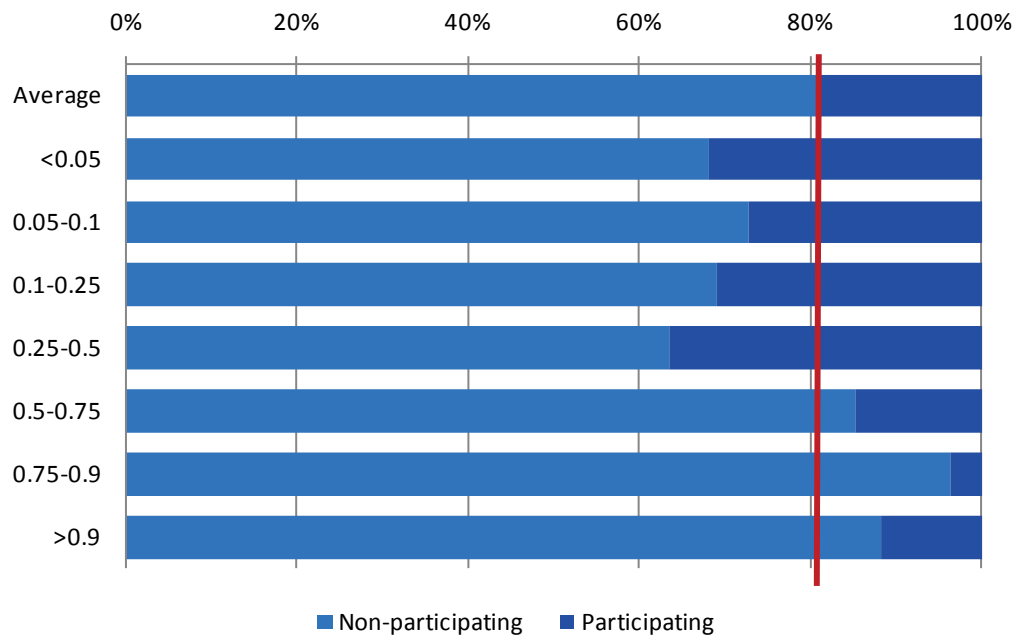
Figure 21 shows the balance sheet expansion for participating and non-participating banks, by percentile of balance sheet expansion.

The top bar describes the ratio of participating-to-non-participating banks that expanded their balance sheets at the average level. It shows that many more non-participating banks were expanding their balance sheets than participating banks, in a ratio of more than 80-to-20.

The bars below the top bar provide similar information for different percentiles of balance sheet expansion. So, for instance, a bank in the 90th percentile expanded its balance sheet more than at least 90% of banks in the sample. The bottom bar describes the ratio of participating and non-participating banks that were in the 90th percentile (indicated by >0.9), and sequentially, the 75th-90th percentile (indicated by 0.75-0.9), the 50th-75th percentile (indicated by 0.5-0.75), etc.

Overall, non-participating banks expanded their balance sheets by more than participating banks over the period. This is particularly the case for the banks having expanded their balance sheet by more than the median banks (i.e. top 50th percentile) as non-participating banks outweigh participating banks from the 50th percentile upwards. However, the opposite holds in the case of institutions having expanded their balance sheet by less than the median bank.

Figure 21: Balance sheet expansion for participating and non-participating banks, by percentile



Note: Balance sheet expansion measured as proportional expansion of net loans
Source: Bloomberg

Background

There is a large contemporary literature explaining patterns of lending through general conditions in the banking sector and bank-specific factors.[20]

This literature seeks to explain historical experience showing that problems in the banking system lead to adverse credit conditions that are reflected in the real economy, as during the recent financial crisis.

[20] See de Bondt (1999) is the key study for Europe. In addition, see Favero et al. (1999), Kasyap and Stein (2000), Kishan and Opiela (2000), Ehrmann et al. (2001, 2003), Altunbaş et al. (2002), and Gambacorta and Mistrulli (2003, 2004) in Altunbaş et al. (2004)

Overall, these studies suggest the prominence of variables capturing general conditions in the banking sector and bank-specific variables, especially relating to bank capital in a model of lending.

In essence, the structure of the lending model is a reduced form of:

- a demand of banks loans which depends on the state of the economy and borrowing costs as represented by the long-term interest rate
- a supply of loans which depends on the intermediation and maturity transformations margins, i.e. the difference between long-term rates and short rates representing various short-term funding sources (wholesale market, central bank) and the volume of funds available to the bank to lend out. In addition to these factors, the size of its impaired portfolio is assumed to affect negatively a bank's willingness to lend, ceteris paribus, as the larger the impaired portfolio the greater the need to rebuild the balance sheet. This broad characterisation of the supply of loans builds on the recent emphasis in the literature of the a reformulated lending channel for the transmission of monetary policy which recognises that bank lending is not simply reacting passively the variations in deposits but is actively managed by banks which can rely on wholesale markets to meet their funding needs (see, for example Disaytat (2010)).

The equation shown in the next section is simply a reduced form of these demand and supply equation.

This background motivates the inclusion of the following controls in the specification for estimating the impact of state guarantees on lending.

Empirical strategy

The main empirical specification considered is based on the following difference-in-differences model for participating and non-participating banks over the period 2005-2010.

$$\Delta LENDING_{it} = \beta_1 GUARANTEED_{it-1} + \beta_2 GUARANTEE\ YEAR_{it} + \beta_3 BANK\ RATING_{it} + \beta_4 \Delta RESERVES_{it-1} + \beta_5 \Delta REAL\ GDP_{jt} + \beta_6 \Delta INTEREST\ RATE\ (LONG\text{-}TERM)_{jt} + \beta_7 \Delta INTEREST\ RATE\ (SHORT\text{-}TERM)_{jt} + \beta_8 \Delta INTERBANK\ RATE_t + \beta_9 \Delta VOL_t + \boldsymbol{\gamma \Delta BANK\ CAPITAL_{it-1}} + \boldsymbol{\delta T_t} + \boldsymbol{\lambda T_t * COUNTRY_i} + v_i + \varepsilon_{it} \quad (7)$$

For each bank, i, in country of risk, j, in year, t:

- $LENDING_{it}$ is measured by net loans
- $GUARANTEED_{it-1}$ is whether or not the bank participated in a state guarantee scheme
- $GUARANTEE\ YEAR_{it}$ indicates the first year in which the bank participated in a state guarantee scheme
- $BANK\ RATING_{it}$ is a categorical variable ranging from AAA to B+
- $RESERVES_{it-1}$ is reserves for impaired loans as a proportion of total liabilities and equity
- $REAL\ GDP_{it}$ is real gross domestic product of the country
- $INTEREST\ RATE\ (LONG\text{-}TERM)_{jt}$ is the interest rate on the 10-year government bond of the Member State

- *INTEREST RATE (SHORT-TERM)*$_{jt}$ is the central bank or official rate used as the main instrument of monetary policy
- *INTERBANK RATE*$_{jt}$ is the 1-month EURIBOR rate[21]
- VOL_t is a key measure of market expectations of near-term up to long-term volatility based on the volatility of the EURO STOXX 50 options prices
- ***BANK CAPITAL***$_{it-1}$ is a vector of variables capturing long- and short-term funding at an aggregated or disaggregate level based on the different models below
- $\boldsymbol{T_t}$ is a vector of time dummies
- $\boldsymbol{T_t}$***COUNTRY***$_i$ is a vector of country-time interaction effects
- v_i is a bank-specific error term
- ε_{it} is an idiosyncratic error term

Time and country effects account for unobserved heterogeneity at the country level and across time that may be correlated with state guarantees. Time and country interaction effects are used to capture time-varying country effects that may be correlated with state guarantees. The abovementioned variables are described in greater detailed in Section 4.2.2.

Additionally, due to the presence of heteroscedasticity and autocorrelation (indicated by diagnostic tests) and the possibility of contemporaneous correlation, the difference-in-differences model is estimated with Driscoll-Kraay standard errors that are robust to the abovementioned forms of dependence.

In addition, we estimate the log difference-in-differences version of the main empirical specification to interpret coefficient estimates of log differenced variables as proportionate changes or elasticities.

Impacts

Table 22 on page 103, column 3 estimates the log difference-in-differences lending model. The R^2 is 0.55 and the majority of coefficients are in the expected direction and are statistically significant at more than the 99% level, or 5%/10% level.

Lending depends positively on short- and long-term funding, although it is more sensitive to the former, as might be expected. Specifically, a 1% change in short-term funding is associated with lending growth of 0.13% while a 1% change in long-term funding is associated with lending growth of 0.07%.

Banks that are rated higher than others lend more, in general. Evaluated at the mean level of lending, if a bank is rated one notch higher than others it lends €2.3m more.

Macroeconomic factors, growth in GDP and the term structure of interest rates (i.e., the long- and short-term interest rates), are statistically significant and operate in the expected direction. Banks

[21] Because the interbank lending rate was at times severely stressed, the correlation between the short-term interest rate and the Euribor rate is only 0.783 over the estimation period.

undertake greater lending the higher the growth rate and the higher the long-term rate and less lending the higher the short-term rate.

The coefficient capturing the impact of state guarantees is negative and statistically significant. This suggests that banks that participated in state guarantee schemes lent less than non-participating banks. Evaluated at the mean level of lending, banks that issued SG bonds lent €4.9 million less than banks that issued non-SG bonds, on average. Thus, banks that issued SG bonds do not appear to have gained an undue advantage in the market for loans.

It is important to stress that the model does not aim to predict what the level of lending would have been in the absence of the provision of a state guarantee but simply aims to assess whether the lending performance of those banks that issued SG bonds differs from the performance of the banks that did not issue SG bonds but were eligible to do so.

Table 22, column 4 estimates the main empirical specification also. However, in place of an indicator variable for participation and non-participation we use a measure for the intensity of participation in state guarantee schemes (or through ad hoc guarantees). This variable, $GUARANTEE\ SIZE_{it-1}$, is given by the ratio of the value of SG bonds issued by bank i in period t-1 as a proportion of total liabilities and equity.

This model explains a similar amount of the variation in the data as the previous model, with an R^2 of 0.55. Additionally, the signs and significance of the regressors are similar to before. In relation to bank-specific variables, lending varies positively with long- and short-term funding and ratings. And, in regard to macroeconomic factors, lending varies positively with real GDP, the long-term interest rate and the interbank rate and negatively with the short-term rate.

The impact of state guarantees is of a similar nature to that found in the previous model. Namely, banks issuing SG bonds lend statistically less than banks not issuing SG bonds. Additionally, the greater the level of SG bonds issued as a proportion of total liabilities and equity, the less banks would lend. In terms of magnitude, on average, if a participating bank issues 10% more SG bonds than it previously was it would result in lending falling by €5.4m.

Finally, we estimate a regression in which we include a term for the intensity of participation in state guarantee schemes, $GUARANTEE\ SIZE_{it-1}$, as well as a squared term of the intensity of participation in state guarantee schemes, $GUARANTEE\ SIZE^2_{it-1}$. Again, we find that banks issuing more SG bonds lent less. But, it may be that the relationship between SG bond issuance activity and lending is non-linear.

The findings of this regression are reported in Table 22, column 5. Both coefficients for $GUARANTEE\ SIZE_{it-1}$ and $GUARANTEE\ SIZE^2_{it-1}$ are statistically significant. The coefficient on $GUARANTEE\ SIZE_{it-1}$ is negative while $GUARANTEE\ SIZE^2_{it-1}$ is positive, which is consistent with the view that as more SG bonds are issued the impact on lending reduces.

Table 20 elaborates the impact of different changes in SG bond issuance activity on lending based on the model estimated in column 5.

Table 20: Impact of different changes in SG bond issuance activity on lending		
Increase in SG bond issues / total liabilities and equity (Δ GUARANTEE SIZE$_{it-1}$)	Impact on lending	
	€m	%age
1%	-5.9	-0.084
2%	-11.8	-0.17
5%	-29.5	-0.42
10%	-59.1	-0.84

We further refined the analysis be separating the population of banks used to estimate the models reported above into "healthy" banks "stressed" banks and re-estimate the main empirical specification for the latter subset of banks.

Cluster analysis is used to identify the subsample of “stressed” banks on the basis of indicators of ease/difficulty of raising external funds. Four indicators were considered:

- whether or not the bank was issuing a dividend
- asset risk
- size
- credit rating

We use these as they are the types of information investors would use in making a determination of the health status of banks (i.e., "healthy" or "stressed") and therefore the returns they would require in order to make an investment.

Table 21: Clusters of healthy and ailing banks, by clustering variable		
Clustering variable	Healthy bank-years	Stressed bank-years
Dividend paid	650	81
Asset risk	328	52
Size	1559	57
Bank credit rating	1,487	649

Note: Kmeans cluster analysis was used in determining clusters

The results of the cluster analysis are displayed in Table 21. Our interest is in estimating our lending model for “stressed” banks. However, as can be seen by the results of the cluster analysis, all subsamples of ailing banks were too small, with the exception of that based on bank rating. So, we are only able to re-estimate our lending model for clusters of “healthy”/”stressed banks” on the basis of credit ratings.

Re-estimating the main empirical specification for the subsample of “stressed” banks identified on the basis of credit ratings, we observe that “stressed” banks issuing SG bonds lent even less than “healthy” banks issuing SG bonds (compared to “stressed”/”healthy” banks not issuing SG bonds respectively). This is consistent with banks in greatest need of state guarantees utilising funding to bolster their balance sheets rather than expanding lending activity. These results are shown in Table 22, columns 8 and 9.

Table 22: Estimation results of lending model

	Difference-in-differences (d-in-d) model[1]		Log D-in-d model			Log d-in-d model for healthy banks		Log d-in-d model for ailing banks	
Variable	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
State guaranteed bank *(GUARANTEED$_{it}$)*	**-1.63e+7*** (5.568e+06)**		**-0.0868*** (0.0198)**			**-0.0615*** (0.0143)**		**-0.105*** (0.0212)**	
Size of guarantee *(GUARANTEE SIZE$_{it}$)*		**-1.28e+8*** (2.974e+07)**		**-0.947*** (0.296)**	**-1.868*** (0.660)**		**-0.694* (0.393)**		**-1.449*** (0.497)**
Size of guarantee squared *(GUARANTEE SIZE$^2_{it}$)*					**5.058** (2.087)**				
Change in total long-term funding *(ΔLONG-TERM FUNDING$_{it}$)*	-0.252 (0.181)	-0.255 (0.183)	0.0660*** (0.0117)	0.0665*** (0.0120)	0.0679*** (0.0122)	0.0598*** (0.0206)	0.0618*** (0.0205)	0.0619*** (0.0113)	0.0596*** (0.0103)
Change in total ST funding *(SHORT-TERM FUNDING$_{it}$)*	0.0762 (0.132)	0.0776 (0.130)	0.128*** (0.0411)	0.128*** (0.0402)	0.127*** (0.0396)	0.0694 (0.0599)	0.0664 (0.0617)	0.187** (0.0810)	0.183** (0.0794)
Bank rating *(BANK RATING$_{it}$)*	4.180e+06** (1.782e+06)	5.619e+06** (2.776e+06)	0.0396*** (0.00740)	0.0452*** (0.00825)	0.0424*** (0.00818)	0.0243 (0.0218)	0.0358 (0.0243)	-0.0190* (0.00984)	-0.0850* (0.0489)
Reserves for impaired loans *(RESERVES$_{it}$)*	-1.016e+08 (2.087e+08)	-1.321e+08 (2.351e+08)	-0.00371 (0.00904)	-0.00623 (0.00944)	-0.00471 (0.00966)	-0.00514 (0.0206)	-0.00753 (0.0217)	-0.00401 (0.0127)	-0.00348 (0.0132)
Change in real GDP *(ΔREAL GDP$_{it}$)*	4,226*** (1,489)	3,508*** (1,128)	1.340*** (0.0660)	0.000552*** (2.72e-05)	0.000553*** (2.73e-05)	0.000660*** (3.12e-05)	0.000652*** (3.10e-05)	1.156*** (0.137)	0.000437*** (4.98e-05)
Long-term interest rate *(INTEREST RATE (LONG-TERM)$_{jt}$)*	1.32e+06*** (216,839)	1.11e+06*** (264,357)	0.0293*** (0.00198)	0.0885*** (0.00391)	0.0884*** (0.00375)	0.0368*** (0.00730)	0.0390*** (0.00841)	0.0230*** (0.00220)	0.0895*** (0.00992)
Short-term interest rate *(INTEREST RATE (SHORT-TERM)$_{jt}$)*	-1.548e+07* (8.672e+06)	-1.134e+07 (7.130e+06)	-0.0583*** (0.00813)	-0.593*** (0.0233)	-0.595*** (0.0232)	-0.773*** (0.0381)	-0.768*** (0.0363)	0.0152 (0.0251)	-0.0534 (0.0355)
Interbank rate *(INTERBANK RATE$_{jt}$)*	9.981e+06* (5.830e+06)	7.891e+06 (5.190e+06)	0.0205** (0.00795)	0.413*** (0.0141)	0.411*** (0.0144)	0.600*** (0.0242)	0.604*** (0.0226)	-0.0388*** (0.0141)	-0.00838 (0.0192)

Table 22: Estimation results of lending model

	Difference-in-differences (d-in-d) model[1]		Log D-in-d model			Log d-in-d model for healthy banks		Log d-in-d model for ailing banks	
Variable	**(1)**	**(2)**	**(3)**	**(4)**	**(5)**	**(6)**	**(7)**	**(8)**	**(9)**
Volatility (VOL_{it})	-1.322e+06* (675,557)	-992,730* (553,198)	-0.00668*** (0.000798)	-0.0563*** (0.00189)	-0.0564*** (0.00190)	-0.0837*** (0.00299)	-0.0832*** (0.00283)	0.00142 (0.00158)	-0.00871*** (0.00282)
Year of state guarantee *($GUARANTEE\ YEAR_{it}$)*	-9.87e+6*** (1.834e+06)	-5.689e+06* (3.342e+06)	-0.0387* (0.0224)	-0.0194 (0.0184)	-0.0252 (0.0216)	-0.00881 (0.0150)	0.00722 (0.0150)	-0.0602*** (0.0144)	-0.0459*** (0.0140)
Additional controls (not displayed)									
Year dummies ($\boldsymbol{T_t}$)	Y	Y	Y	Y	Y	Y	Y	Y	Y
Year-country dummies ($\boldsymbol{T_t}$*$\boldsymbol{COUNTRY_i}$)	Y	Y	Y	Y	Y	Y	Y	Y	Y
Number of observations (SG-to-non-SG bank-years)	*642 (480:162)*	*642 (480:162)*	*638 (475:163)*	*638 (475:163)*	*638 (475:163)*	*312 (233:79)*	*312 (233:79)*	*326 (243:83)*	*326 (243:83)*
Adjusted-R^2	*0.218*	*0.212*	*0.549*	*0.548*	*0.550*	*0.461*	*0.459*	*0.720*	*0.724*

Note: Variables not in logged terms in difference-in-differences models (1) and (2)

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4.4.3 Impact of state guarantees on leverage

Background

This section investigates the impact of state guarantees on bank capital structure, and specifically, the impact of state guarantees on bank leverage ratios. The motivation for this analysis is based on the notion that leverage ratios provide an insight into the risk-taking behaviour of banks, and therefore, if there exists a relationship between participation in state guarantee schemes and leverage ratios, we might be able to make inferences about the influence of state guarantees on bank risk-taking.

The theoretical foundation regarding the relationship capital structure (e.g., leverage ratios) and bank decision-making (e.g. on risk) is the Modigliani-Miller irrelevance proposition (1958). This states that in perfectly competitive capital markets and given certain other assumptions, returns to alternative forms of capital are equal and therefore capital structure should have no bearing on bank decision-making.

With this as the point of departure, theoretical work since the Modigliani-Miller irrelevance proposition has elaborated reasons why there might be a relationship between capital structure and bank decision-making.

One set of theories accounts for capital regulation, namely, that banks are required to hold a minimum amount of capital in order to mitigate moral hazard that might arise due to deposit insurance, among other reasons (e.g. Berger et al., 1995, Miller, 1995, and Santos 1995). Given that there is a cost associated to holding capital and the constraint of capital regulations such as Basel II, these theories predict that banks would all hold close to the minimum required by capital regulations. In the context of the present study, state guarantees may increase moral hazard and therefore we may expect to see larger leverage ratios for participating banks than non-participating banks, all else equal.

Another body of work (e.g. Ayuso et al., 2004 and Peura and Keppo, 2006) adds that there may be a rationale for banks to hold additional capital as a buffer against falling below threshold set by capital regulations. This is due to the costs associated with raising funds at short notice (e.g. through an equity issue). However, due to the presence of asymmetric information, investors are unaware of the rationale behind an institution's equity issue. On the one hand, a "healthy" bank may require equity to expand its activities, which would yield positive future returns on equity. But, on the other hand, an "ailing" bank may yield negative future returns on equity.

Within this framework, signals that may discriminate healthy from ailing banks indicate the costs banks may face in raising funds at short notice. These signals include whether the bank pays dividends, has relatively high profits, high market-to-book ratios (proxied by total earning assets to total assets), etc.

A priori, this framework does not provide insight as to the influence of bank size on capital buffers. This is because it may be that well-known (large) banks face less costs of raising funds at short notice, that is, being well-known alleviates the asymmetric information problem. Or, it may be that more complex (large) banks face greater asymmetric information problems and therefore face more costs of raising funds.

In regard to state guarantees, there is some consistency between this framework and the framework relating to the influence of capital regulation on capital structure. Namely, there may exist some element of 'moral hazard' insofar as banks may be motivated to hold smaller capital buffers in the knowledge that missed SG bond payments are covered by state guarantors.

However, banks may also be aware that missing SG bond payments would signal that they are ailing, causing the cost of raising funds to increase, meaning that they may hold additional capital buffers to guard themselves against this possibility.

Table 23 summarises the predictions of the capital regulation and capital buffers view. Gropp and Heider (2009) note that the empirical corporate finance literature has converged on this limited set of variables that are reliably related to leverage.

Table 23: Predicted effects of explanatory variables on leverage: capital regulation view vs. buffer view

	Predicted effects	
	Capital regulation	**Buffer**
Total earning assets-total assets ratio	-	+
Profits	-	+
Log (size)	+	+/-
Dividends	-	+
Risk	-	-

Source: Adapted from Gropp and Heider (2009)

Empirical strategy

Given the background above, the equation below describes the leverage model, augmented to capture state guarantees.

$$\Delta \log (LEVERAGE)_{it} = \beta_1 \Delta \log (TOTAL\ EARNING\text{-}TO\text{-}TOTAL\ ASSETS)_{it-1} + \beta_2 \Delta \log (PROFITS)_{it-1} + \beta_3 \Delta \log (SIZE)_{it-1} + \beta_5 DIVIDEND_{it-1} + \beta_6 GUARANTEED_{it-1} + \beta_7 GUARANTEED\ YEAR_{it} + \boldsymbol{\delta T_t + \lambda T_t * COUNTRY_i} + v_i + \varepsilon_{it} \quad (8)$$

For each bank, i, in country of risk, j, in year, t:

- $LEVERAGE_{it}$ is measured by 1-(total equity/total assets)
- $TOTAL\ EARNING\text{-}TO\text{-}TOTAL\ ASSETS_{it-1}$ is given by the ratio of total earning assets to total assets
- $PROFITS_{it-1}$ is the sum of pre-tax profits and total interest expenses as a proportion of total assets
- $SIZE_{it-1}$ is measured by total assets
- $DIVIDEND_{it-1}$ is an indicator variable for whether or not the bank issued a dividend
- $GUARANTEED_{it}$ is whether or not the bank participated in a state guarantee scheme
- $GUARANTEE\ YEAR_{it}$ indicates the first year in which the bank participated in a state guarantee scheme

- $\boldsymbol{T_t}$ is a vector of time dummies
- $\boldsymbol{T_t}$***COUNTRY**$_i$* is a vector of country-time interaction effects
- v_i is a bank-specific error term
- ε_{it} is an idiosyncratic error term

Time and country effects account for unobserved heterogeneity at the country level and across time that may be correlated with state guarantees. Time and country interaction effects are used to capture time-varying country effects that may be correlated with state guarantees. And, due to the presence of heteroscedasticity and autocorrelation (indicated by diagnostic tests) and the possibility of contemporaneous correlation, a fixed effects model with Driscoll-Kraay standard errors that are robust to the abovementioned forms of dependence is used.

Impacts

Table 25 (columns 1 and 2) show the results of the main leverage model. All coefficients are statistically significant at less than the 1% level aside from profits. Banks' leverage depends positively on size, and negatively on the ratio of total earning assets to total assets and dividends. The models also explain variation in the data relatively well, with an adjusted R^2 of 0.4.

We observe participation in state guarantee schemes (i.e., $GUARANTEED_{it}$=1 as opposed to $GUARANTEED_{it}$=0) is associated with lower leverage. Specifically, banks that issued bonds with state guarantees are likely to be 0.2% less levered than comparable banks that did not issue state guaranteed bonds.

Moreover, banks that utilised state guarantees more intensively, i.e., through the issuance of a larger volume of state guarantees, were even less levered. A proportionate increase in state guaranteed bonds relative to total equity and liabilities of 1% was associated with a 3.4% decrease in market leverage. This effect was significant beyond the 99% level.

Overall, banks that take up state guarantees are likely to be less levered. Under the regulated capital view, it may be that participation in state guarantee schemes were implicitly conditional on banks being more cautious, as reflected in levels of market leverage.

Under the capital buffers view, these banks may have signalled to the market that they are "ailing banks" through participation in state guarantee schemes, in the terminology used above. Therefore, they face higher costs of capital than other banks and hold larger capital buffers to insure against the need to access capital markets.

Robustness

To test for the robustness of the main results, a number of alternative specifications were estimated, as shown in Table 24, columns 3-8.

A measure of asset risk was added to the main specifications. This is motivated by the following reasons. Under the regulatory view, regulators may require riskier banks to hold more capital on a discretionary basis. Omitting risk from our main leverage model, therefore, may lead to spurious significance of the remaining variables. However, we see that the main results are robust to the inclusion of a measure of asset risk.

Interestingly, however, the inclusion of asset risk in the leverage model leads to the coefficient on size to become insignificant. This suggests that size was proxying for the riskiness of bank assets, which is the underlying driver of leverage.

Another robustness test, shown in Table 24, columns 5, was to add macroeconomic control variables to the main empirical specifications. The signs and significance of the impact of state guarantees variables are consistent with the main impacts in these results. Furthermore, the majority of the macroeconomic variables operate in the expected directions. Leverage increases with the long-term rate and the interbank rate, and decreases with the short-term rate. Somewhat counter-intuitively though, the results show that leverage decreases with GDP growth and increases with volatility, though the latter effect is small.

Finally, the main empirical specifications were re-estimated with banks' Tier 1 Capital as a proportion of risk weighted assets as an alternative measure of leverage. The estimation results of these models are provided in Table 24, columns 7-8. The signs and significance of the impact of state guarantees variables are consistent with the results on the main impacts also.

Table 24: Estimation results of leverage model

	Main model		Controlling for asset risk		Controlling for macro variables		Tier 1 capital as alternative dependent variable	
Variable	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
State guaranteed bank ***(GUARANTEED$_{it}$)***	**-0.00261*** (0.000894)**		**-0.00622*** (0.00131)**		**-0.00218** (0.000861)**		**0.0781*** (0.0104)**	
Size of guarantee ***(GUARANTEE SIZE$_{it}$)***		**-0.0340*** (0.0100)**		**-0.102* (0.0527)**		**-0.0320*** (0.0107)**		**1.860*** (0.370)**
Ratio of total earning-to-total assets *Δ log (TOTAL EARNING-TO-TOTAL ASSETS)$_{it-1}$*	-0.0428*** (0.0133)	-0.0407*** (0.0125)	-0.0876*** (0.0120)	-0.0736*** (0.0183)	-0.0369*** (0.00923)	-0.0352*** (0.00905)	0.130 (0.197)	-0.0725 (0.0973)
Profits *Δ log (PROFITS)$_{it-1}$*	-0.000340 (0.00110)	-0.000188 (0.00116)	-0.000752 (0.00110)	0.000223 (0.00106)	0.00176** (0.000680)	0.00189*** (0.000676)	-0.0448*** (0.0162)	-0.0547*** (0.0133)
Total assets *Δ log (SIZE)$_{it-1}$*	0.00963*** (0.00265)	0.00949*** (0.00268)	-0.00255 (0.00181)	-0.00140 (0.00218)	0.0109*** (0.00275)	0.0107*** (0.00278)	0.144*** (0.0268)	0.134*** (0.0225)
Dividend *DIVIDEND$_{it-1}$*	-0.00407*** (0.00136)	-0.00420*** (0.00146)	-0.00990*** (0.00254)	-0.00957*** (0.00235)	-0.00440*** (0.00139)	-0.00455*** (0.00148)	0.0446*** (0.0158)	0.0403** (0.0156)
Year of state guarantee *(GUARANTEE YEAR$_{it}$)*	0.000453 (0.00148)	0.00117 (0.00108)	-0.00266** (0.00125)	-0.00121 (0.00172)	0.000566 (0.00140)	0.00114 (0.00109)	0.0954*** (0.0183)	0.0861*** (0.0259)
Change in real GDP *(ΔREAL GDP$_{it}$)*					-0.0240*** (0.00480)	-0.0237*** (0.00484)		
Long-term interest rate *(INTEREST RATE (LONG-TERM)$_{jt}$)*					0.00115*** (0.000243)	0.00111*** (0.000239)		
Short-term interest rate *(INTEREST RATE (SHORT-TERM)$_{jt}$)*					-0.00326*** (0.000702)	-0.00305*** (0.000710)		
Interbank rate *(INTERBANK RATE$_{jt}$)*					0.00530*** (0.000725)	0.00531*** (0.000759)		

Table 24: Estimation results of leverage model

	Main model		Controlling for asset risk		Controlling for macro variables		Tier 1 capital as alternative dependent variable	
Variable	**(1)**	**(2)**	**(3)**	**(4)**	**(5)**	**(6)**	**(7)**	**(8)**
Volatility (VOL_{it})					3.87e-04*** (3.75e-05)	3.75e-04*** (3.68e-05)		
Additional controls (not displayed)								
Year dummies ($\boldsymbol{T_t}$)	Y	Y	Y	Y	Y	Y	Y	Y
Year-country dummies ($\boldsymbol{T_t}$*$\boldsymbol{COUNTRY_i}$)	Y	Y	Y	Y	Y	Y	Y	Y
Number of observations	427	427	171	171	418	418	161	161
Adjusted-R^2	0.4	0.4	0.69	0.68	0.38	0.38	0.90	0.89

Note: Dependent variable is market leverage defined as 1-(total equity/total assets) in columns 1-6. Dependent variable is Tier 1 Capital ratio in columns 7-8.

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4.5 Summary of key findings

The impact on bank lending, funding and profitability of the provision of state guarantees to bond issues by banks varies.

A simple, descriptive analysis of the impact of the guarantees provided in 2009 shows that in the following year (i.e., 2010),

- banks having issued guaranteed bonds increased their net loan book by less than banks having issued noon-guaranteed bonds that would have been eligible;
- however, these banks increased their short-term and long-term funding by more than banks having issued non-guaranteed bonds and their equity capital by less;
- moreover, the banks having issued guaranteed bonds show a worse post-issue profit performance (measured either by ratio of net interest income to total liabilities and equity or operating income to total liabilities and equity).

A more detailed statistical analysis shows that the simple categorisation into banks issuing SG bonds and banks not having issued SG bonds is often not granular enough to assess the full impact of the state guarantee schemes on various outcomes at the bank level.

The key results of the econometric analysis of bank performance show that:

- banks that issued SG bonds lent less than banks that were eligible to issue SG bonds but did not so. Thus, it does not appear that the issue of SG bonds created a distortionary effect and did not result in a competitive advantage for these banks. Furthermore, the larger the annual volume of SG bond issuance(s) (relative to total liabilities and equity), the smaller the lending increase relative to eligible banks that did not issue SG bonds
- banks that issued SG bonds reduced their leverage ratio relative to eligible banks that did not so. This effect is more pronounced for banks that issued a larger volume of SG bonds.

5 Key empirical findings and policy recommendations

The statistical analysis of the impact of the provision of a state guarantee to a short- to medium-term bond issue shows that, on average, the market value of state guarantees was 33.4bps. This finding is robust to different model specifications.

While each individual state guaranteed bond issue benefited from the state guarantee through a lower issue cost, all bond issues (state guaranteed and non-state guaranteed) were impacted negatively by the overall volume of SG bond issues during a month. Quantitatively, each bond issue faced a higher issuance cost of 10.5bps, on average, as a result of the overall volume of SG issuance activity in a given month.

Moreover, this negative impact is marginally higher for non-state guaranteed bonds issued by banks which did not participate in the scheme (20.3bps, on average, in a given month) than for bonds (state guaranteed and non-state guaranteed) issued by participating banks. In the case of the latter, only state guaranteed bond issues were impacted.

This indirect effect is entirely domestic as the monthly volume of state guaranteed bond issues outside a Member State is not found to impact on the issuance cost of state guaranteed and non-state guaranteed bonds in the domestic market.

The impact on bank lending, funding and profitability of the provision of state guarantees to bond issues by banks varies. A simple, descriptive analysis of the impact of the guarantees provided in 2009 shows that in the following year (i.e., 2010),

- banks having issued guaranteed bonds increased their net loan book by less than banks having issued noon-guaranteed bonds that would have been eligible;
- however, these banks increased their short-term and long-term funding by more than banks having issued non-guaranteed bonds and their equity capital by less;
- moreover, the banks having issued guaranteed bonds show a worse post-issue profit performance (measured either by ratio of net interest income to total liabilities and equity or operating income to total liabilities and equity).

A more detailed statistical analysis shows that the simple categorisation into banks issuing SG bonds and banks not having issued SG bonds is often not granular enough to assess the full impact of the state guarantee schemes on various outcomes at the bank level.

The results of the econometric analysis shows banks that issued SG bonds a) lent less than banks that were eligible to issue SG bonds but did not so and b) reduced their leverage ratio.

Overall, these results suggest that the guarantee schemes were successful in lowering the costs of bond issues of participating banks while having relatively little distortionary impacts on non-participating banks. Moreover, cross-border spill-overs appear to be non-existent.

In that regard, to the extent that the objective of the state guarantee schemes was to reduce the cost of funds for banks, the design of the schemes can be said to have been relevant, appropriate and well targeted.

Access, however, may have been overly generous in the sense that some issuance of state guaranteed bonds continued through 2010, a period during which financial market conditions had stabilised even though they had not yet returned to normal.

More importantly, the detailed statistical analysis suggest that is the intensity of usage of the guarantee schemes and not mere participation in the scheme which determines whether banks having participated in the state guarantee schemes expanded their net lending. This observation suggests that, in the future, one may wish to subject participation in a similar state aid scheme to a minimum size in order to achieve a positive bank lending impact. Obviously, the minimum participation size should be determined in relation to the size of the participating bank.

That being said, it is critical to note that a simple comparison of the pre-issue and post-issue lending, funding and profit performance of participating and non-participating banks shows that neither of the two sets of banks are homogenous groups and that actual outcomes in terms of lending, funding and profitability of each bank shows a great dispersion around the mean of each group.

Therefore, one should be very prudent in drawing any policy conclusions concerning scheme design and effectiveness with regards to bank outcomes.

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Annex 1 Eligibility criteria for state guarantees

The sections below set out eligibility criteria for entry into SG schemes by Member state and *ad hoc* guarantees. Where feasible, these criteria were 'operationalised' using Bloomberg Data® to identify the comparison group for the empirical analysis.

A1.1 State guarantee schemes

A1.1.1 Austria[22]

Implementation date of scheme

9 December 2008

End date of entry into scheme

31 December 2010 (originally 31 December 2009)

Fee for instrument

The issuer pays 70 bps, 100 bps or 150 bps contingent on its credit rating

Maximum tenor

5 years

Institution criteria

Credit institutions and insurance companies licensed in Austria

Instrument eligibility

Fixed income securities for the purpose of investing the proceeds in other banking transactions

Scale of scheme

€75 billion

[22] For details see:
http://www.bmf.gv.at/Finanzmarkt/ManahmenpaketzurSic_9175/aBelebungdesInterba_9176/BundeshaftungfrWert_9183/Austrian_Garantee_Scheme_for_Bank_Lending.pdf;
http://english.bmf.gv.at/Ministry/IBSG-FinStaG_EN.pdf;
http://www.oenb.at/en/img/bwg_108_2007_engl__version_18_02_08_fma_tcm16-11181.pdf;
http://www.erstebank.hu/file/20090114_Erste_Group_bond_program_with_state_guarantee__eng_.pdf;
http://ec.europa.eu/competition/state_aid/cases/228278/228278_1003834_60_1.pdf;
http://ec.europa.eu/competition/state_aid/cases/236586/236586_1128712_22_1.pdf.

A1.1.2 Germany[23]

Implementation date of scheme

18 October 2008

End date of entry into scheme

28 April 2009

End date of scheme

31 December 2009

Fee for instrument

In line with the rates approved by the EU Commission in the Communication 'The recapitalisation of financial institutions in the current financial crisis: limitation of aid to the minimum necessary and safeguards against undue distortions of competition'[24]

Maximum tenor

5 years

Institution criteria

Institutions that can be involved in the scheme include German credit institutions, financial service providers, insurance companies, pension funds, investment management companies, operators of securities and commodities exchange and certain parent companies of the aforementioned entities. SoFFin has imposed the following duties on eligible institution: (1) obligation on shareholders to recapitalise the relevant eligible institution, (2) the provision of a restructuring plan, (3) adjustment of the business model and spin-off of bad assets to ensure the long-term survival of the eligible institution

Instrument eligibility

Only non-complex securities are eligible and only securities denominated in Euros unless SoFFin can hedge its currency exposure with the relevant eligible institution bearing the associated costs.

Scale of scheme

€400 billion

[23] For details see:
http://www.linklaters.com/pdfs/publications/capitalmarkets/StateGuaranteesGuide.pdf ;
http://www.mayerbrown.com/publications/article.asp?id=7848&nid=6 .

[24] http://ec.europa.eu/competition/state_aid/legislation/recapitalisation_communication.pdf

A1.1.3 Denmark[25]

Implementation date of scheme

6 October 2008 (amended on 3 February 2009)

End date of entry into scheme

31 December 2010 (originally set at 30 September 2010)

Fee for instrument

After the amendment:

(i) for banks with CDS data the fee was the lower of: either the median value of the 5-year CDS spread over a sample period starting on 1 January 2007 and ending on 31 August 2008; or the median value of the 5-year CDS spread during the same sample period for the rating category of the bank concerned;
(ii) for banks without CDS data or without representative CDS data, but with a credit rating, the fee is 50 bps plus median value of 5 year CDS spreads during the same sample period for the rating category of the bank concerned, based on a representative sample of Euro area large banks;
(iii) for banks without CDS data and a credit rating the fee is 50 bps plus the median value of 5 year CDS spreads during the same sample period for the lowest rating category, based on a representative sample of euro area large banks.

Maximum tenor

3 years

Institution criteria

All financial institutions in Denmark with a banking license and a membership to the Sector Fund (mortgage institutions included by the amendment)

Instrument eligibility

Eligible instruments include unsecured obligations, including issued bonds (senior debt) but not including hybrid capital and subordinated debt, covered bonds and debt and deposits secured on government-bonds or covered bonds.

[25] For details see:
http://www.danskebank.com/en-uk/ir/the-group/Pages/Bank-packages.aspx;
http://www.danskebank.com/da-dk/ir/Documents/Presentations/2008_10_PS_DKguarantee.pdf;
http://ec.europa.eu/community_law/state_aids/comp-2008/nn051-08.pdf;
http://ec.europa.eu/community_law/state_aids/comp-2009/n031-a-09-en.pdf;
http://www.finansraadet.dk/bankkunde/det-private-beredskab/medlemmer-i-det-private-beredskab.aspx;
http://borsen.dk/nyheder/privatoekonomi/artikel/1/142720/fakta_disse_banker_er_ikke_omfattet_af_statsgarantien.html .

(Additionally included after amendment: newly issued loans, including commercial papers, senior unsecured bonds, and new loans covering existing debts)

Scale of scheme

DKK 600 billion (approx €80 billion)

A1.1.4 Greece[26]

Implementation date of scheme

19 November 2008

End date of entry into scheme

31 December 2010 (extended from 19 November 2009)

Fee for instrument

For short term (less than 1 year): 50 bps or 25 bps when collateral is provided

For medium term (between 1 and 5 years): 50 bps (25 bps in case of collateral) plus the median of the 5-year CDS spread of the credit institution concerned for the period 1-Jan-2007 to 31-Aug-2008

Maximum tenor

3 years

Institution criteria

Credit institutions authorised to operate in Greece by license from the Bank of Greece, including subsidiaries of foreign institutions

Instrument eligibility

All debt instruments are eligible, except for subordinated debt and interbank deposit

Scale of scheme

€30 billion

[26] For details see:
http://ec.europa.eu/eu_law/state_aids/comp-2008/n560-08.pdf;
http://ec.europa.eu/eu_law/state_aids/comp-2010/n260-10-en.pdf.

A1.1.5 Spain[27]

Implementation date of scheme

18 December 2008

End date of entry into scheme

30 June 2011 (originally set at 15 December 2009)

Fee for instrument

For short term (less than 1 year): fixed annual guarantee premium of 50 bps

For medium term (between 1 and 5 years): fixed annual premium of 50 bps plus a variable fee calculated thus:

(i) for banks with CDS data the fee is the lower of: either the median value of 5-year CDS spread over a sample period starting on 1 January 2007 and ending on 31 August 2008; or the median value of the 5-year CDS spread during the same sample period for the rating category of the bank concerned

(ii) for banks without representative CDS data but with a credit rating, the fee is the median value of 5-year CDS spread during the same sample period for the rating category of the bank concerned. The median will be 36.5 bps annually for a credit institution having a rating of double A and 44.8 bps, if they are rated A

(iii) for banks without CDS data and a credit rating the fee is the median value of 5-year CDS spreads during the same sample period for the lowest rating category. The lowest category is A and the median will be 44.8 bps plus an additional fee of 10 bps.

Maximum tenor

3 years (5 years in exceptional circumstances)

Institution criteria

Institutions eligible for the scheme are: credit institutions; consolidated groups of credit institutions, pools of credit institutions, and; registered in Spain; with a share of at least 1/1000 of the credit market; and have issued since 13 October 2003. Branches of foreign credit institutions are excluded and subsidiaries of foreign credit institutions are included, subject to the same requirements as Spanish credit institutions.

[27] For details see:

http://ec.europa.eu/competition/state_aid/register/ii/doc/NN-54-b-2008-WLWL-en-23.12.2008.pdf;

http://ec.europa.eu/eu_law/state_aids/comp-2010/n530-10-en.pdf.

The issue by date and maturity date were calculated from maximum tenor and implementation date and end date of entry into the Scheme.

Instrument eligibility

Notes and bonds are eligible instruments.
Securitization notes and subordinated debt, interbank deposits, options, derivatives and other instruments whose risk level is difficult to assess for the guarantor are ineligible.

Scale of scheme

€167 billion

A1.1.6 France[28]

Implementation date of scheme

20 October 2008

End date of entry into scheme

31 December 2009

Fee for instrument

The fee is the base cost plus borrowing bank's risk level

Maximum tenor

5 years

Institution criteria

Solvent credit institutions incorporated in France and French subsidiaries of foreign credit institutions, including the banking arms of French car manufacturers

Institutions must comply with certain capital adequacy ratios in accordance with the French Monetary and Financial Code. Each time a credit institution benefits from funds provided by SFEF, a written agreement will have to be signed with the French State addressing a number of issues including a) the number of loans it will grant to businesses, consumers and local authorities; and b) compliance with rules on corporate governance and directors' remuneration. The granting and volume of funds raised in favour of credit institutions will depend on such institutions providing collateral to SFEF.

Instrument eligibility

Debt instruments issued before 31 December 2009 having a maximum duration of 5 years

Scale of scheme

€265 billion

[28] For details see:
http://www.linklaters.com/pdfs/publications/capitalmarkets/StateGuaranteesGuide.pdf;
http://www.mayerbrown.com/public_docs/0370fin-Summary_of_Government_Interventions_France_2col.pdf.

A1.1.7 Ireland[29]

Implementation date of scheme

30 September 2008

End date of entry into scheme

29 September 2010

Fee for instrument

The fee is based on the increased debt servicing costs that Ireland will bear as a result of the Scheme and on the institution's long-term credit rating.

Maximum tenor

5 years

Institution criteria

Scheme is only open to systemically important credit institutions and certain named subsidiaries of such credit institutions.
The following credit institutions and subsidiaries are covered by the scheme: i) Allied Irish Banks plc and its subsidiaries AIB Mortgage Bank, AIB Bank (CI) Limited, AIB Group (UK) plc and Allied Irish Banks North America Inc.; (ii) Anglo Irish Bank Corporation plc and its subsidiary Anglo Irish Bank Corporation (International) plc; (iii) The Governor and Company of the Bank of Ireland and its subsidiaries Bank of Ireland Mortgage Bank, ICS Building Society and Bank of Ireland (I.O.M.) Limited; (iv) EBS Building Society; (v) Irish Life & Permanent plc and its subsidiary Irish Permanent (IOM) Limited; (vi) Irish Nationwide Building Society and its subsidiary Irish Nationwide (I.O.M.) Limited; and (vii) Postbank Ireland Limited.

Instrument eligibility

The following instruments were covered by the Scheme: i) all retail and corporate deposits; ii) interbank deposits; iii) senior unsecured debt; iv) covered bond; and v) dated subordinated debt.

Scale of scheme

€400bn[30]

[29] For details see:

http://www.linklaters.com/pdfs/publications/capitalmarkets/StateGuaranteesGuide.pdf.

The issue by date and maturity date were calculated from maximum tenor and implementation date and end date of entry into the Scheme.

[30] www.finfacts.ie

A1.1.8 The Netherlands[31]

Implementation date of scheme

23 October 2008

End date of entry into scheme

31 December 2010 (extended from 31st December 2009)

Fee for instrument

The fee depended on the maximum tenor and the credit rating of the bank. If longer than 1 year the fixed (FF) and variable (VF) rate applied, whereas if shorter than 1 year just fixed rate applied.

The following lists the fee depending on the credit rating of the institution:

AAA: FF = 75, VF = 53;
AA: FF = 80, VF = 68;
A or A+: FF = 85, VF = 73;
A-: FF=90, VF = 73;
Other: FF = 110, VF = 93 (Maximum annual guarantee fee valid from 1 July 2010 onwards)

Maximum tenor

3 years

Institution criteria

1) a) Must be a bank; b) have its seat in the Netherlands; c) be authorised to perform its banking activities pursuant to Section 2:12(1), 2:13(1) or 3:111(1) of the Financial Supervision Act; and d) be registered in the register as referred to in Section 1:107(2)(a) of the Financial Supervision Act.
2) Must have a substantial business in the Netherlands
3) Must have a solvency ratio which is to the Guarantor's satisfaction, taking into account the requirements of the Financial Supervision Act and any agreement of the bank with, or any directive or request to the bank from, the Dutch Central Bank.
No more than one member of a corporate group may be eligible under the scheme, unless the Guarantor determines otherwise.

[31] For details see:
http://www.linklaters.com/pdfs/publications/capitalmarkets/StateGuaranteesGuide.pdf;
http://www.dsta.nl/english/Subjects/Guarantee_scheme;
http://www.mayerbrown.com/publications/article.asp?id=7854&nid=6.

Instrument eligibility

A non-complex senior unsecured debt instrument on standard market terms which falls within one of the following categories: a) certificates of deposit; b) commercial paper; or medium term notes which by their terms are expressed to be redeemed in one single payment and which carry interest at a fixed or floating rate.

Instruments must be denominated in Sterling, Euro or US Dollar and not contain any event of default constituted by cross-default or cross-acceleration or right of prepayment by the issuer.

Scale of scheme

€200 billion

A1.1.9 Portugal[32]

Implementation date of scheme

24 October 2008

End date of entry into scheme

31 December 2009

Fee for instrument

Fee for short term (less than 1 year) instrument: 50 bps

Fee for medium term (between 1 and 5 years) instrument: relevant CDS Spread plus 50 bps
Follows ECB Recommendation on Government Guarantees on Bank Debts

Maximum tenor

3 years (can be 5 years in exceptional circumstances, following reasoned recommendation by the Portuguese Central Bank)

Institution criteria

Only credit institutions with a registered office in Portugal can participate in the Scheme

Instrument eligibility

Securities must be senior unsecured debt instruments and be denominated in Euros.
Ineligible securities include: interbank deposit operations in the money markets; subordinated debt obligations; operations that already benefit from other guarantees; and financing operations in jurisdictions that do not meet internationally accepted transparency standards.

Scale of scheme

€20 billion

[32] For details see:
http://www.linklaters.com/pdfs/publications/capitalmarkets/StateGuaranteesGuide.pdf;
http://www.min-financas.pt/inf_economica/Portuguese_Guarantee_Scheme_23Oct2008.pdf;
http://www.mayerbrown.com/publications/article.asp?id=7856&nid=6.

A1.1.10 Sweden[33]

Implementation date of scheme

27 October 2008

End date of entry into scheme

30 April 2010 (extended from 30 April 2009)

Fee for instrument

Fee for short term (less than 1 year) instrument: 50 bps

Fee for medium term (1 and 5 years) instrument:

(i) for banks with CDS data, the fee is the median value of the 5-year CDS spread over the period 1 January 2007 to 31 August 2008 plus 50 bps;

(ii) for banks without CDS data, or representative CDS data but with a credit rating, the fee is the median value of the 5-year CDS spread during the above mentioned period for the rating category of the banks concerned, based on a representative sample of Euro area large banks plus 50 bps;

(iii) for banks without CDS data and without credit rating, the fee is the median 5-year CDS spread over the same period for the lowest rating category plus 50 bps;

(iv) for guarantees for covered bonds the fee is 25 bps plus the institution's CDS spread.

Maximum tenor

5 years

Institution criteria

Banks and mortgage institutions incorporated and operating in Sweden (including Swedish subsidiaries of foreign institutions) that are solvent

Instrument eligibility

Eligible instruments include bonds, certificates of deposits and other non-subordinated debt instruments which have a maturity longer than 90 days but less than 5 years.

Scale of scheme

SEK 1,500 billion

[33] For details see:

http://ec.europa.eu/eu_law/state_aids/comp-2008/n533-08.pdf;

http://ec.europa.eu/competition/state_aid/cases/233371/233371_1018309_21_1.pdf.

A1.1.11 Slovenia[34]

Implementation date of scheme

4 December 2008

End date of entry into scheme

30 June 2010 (extended from 12 June 2009)

Fee for instrument

Fee for short term (less than 1 year) instruments: 50 bps

Fee for medium term (between 1 and 5 years) instruments:

(i) for banks with CDS data the fee is the median value of the 5-year CDS spread over the period 1 January 2007 to 31 August 2008 plus 50 bps;

(ii) for banks without CDS data or representative CDS data, but with a credit rating, the fee is the median value of the 5-year CDS spread during the above mentioned period for the rating category of the banks concerned, based on a representative sample of euro area large banks plus 50 bps;

(iii) for banks without CDS data and without credit rating, the fee is the median 5 year CDS spreads over the same period for the lowest rating category plus 50 bps;

(iv) for guarantees for covered bonds, the fee is the institution's CDS spread and the add-on fee of 50 bps, which can be decreased by the Slovenian authorities.

The CDS element is set at 25 bps for AAA-rated institutions, 40bps for AA, 45 bps for A, 50 bps for BBB, 55 bps for BB and below - as regards, the credit institutions with a rating category of A and below, the corresponding element may be adjusted by the Slovenian authorities, depending on the rating of the State itself.

Maximum tenor

5 years

Institution criteria

Credit institutions incorporated in the Republic of Slovenia (including the Slovenian subsidiaries of foreign financial institutions) that are solvent.

Instrument eligibility

Instruments that can be covered by the guarantee are all liabilities with exception of structured financial instruments, subordinated liabilities and liabilities versus parent companies or other

[34] For details see:
http://ec.europa.eu/competition/state_aid/cases/228071/228071_906825_3_1.pdf;
http://ec.europa.eu/eu_law/state_aids/comp-2009/n651-09-en.pdf.

related entities, which have a maturity longer than 90 days but less than five years. The scheme excludes all liabilities that qualify as either Tier 1 or Tier 2 capital. The scheme is not subject to any currency restrictions. The applying institutions have to submit information regarding the size of maturing liabilities and explanation on what actions have been undertaken by the institution itself to obtain the financing on the markets. In addition, the institutions have to explain the hypothetical consequences of not receiving the State guarantee. Instruments guaranteed under this scheme may be issued within 6 months following this decision. The Slovenian authorities have committed that they will notify any extension of the entry window into the scheme to the Commission.

Scale of scheme

€12 billion

A1.1.12 United Kingdom[35]

Implementation date of scheme

13 October 2008

End date of entry into scheme

31 December 2009

Fee for instrument

50 bps plus the median 5-year CDS spread over 12 months up to 1 July 2008 annually plus a fee for the currency exchange cost incurred by the Guarantor (for non-GBP issues)

Maximum tenor

3 years

Institution criteria

An authorised UK deposit-taker (including a UK incorporated subsidiary of a foreign institution) which, in the view of the Guarantor, has a substantial business in the UK or a UK building society. The institution must have or have committed to raise Tier 1 Capital in the amount determined by the Guarantor as at a date to be specified by the Guarantor. In reviewing these applications, the Government will give due regard to an institution's role in the UK banking system and in the overall economy

Instrument eligibility

Senior unsecured debt with standard market terms, and not complex instruments, which are: certificates of deposit; commercial paper; or bonds/notes. Fixed-to-floating or index-linked securities and instalment notes are ineligible.

Currencies (as of 1-Jan-2009): Sterling, Euro, US Dollars, Australian Dollars, Canadian Dollars, Swiss Francs, Japanese Yen, or other such currency as determined by the Guarantor

Scale of scheme

£269 billion

[35] For details see:
http://www.dmo.gov.uk/docs/cgs/press/cgsrules.pdf;
http://www.dmo.gov.uk/docs/cgs/press/mktnotice08.pdf;
http://europa.eu/rapid/pressReleasesAction.do?reference=IP/08/2057.

A1.2 *Ad hoc* guarantees

A1.2.1 Guarantee agreement between the Belgian, French and Luxembourg State and Dexia[36]

Implementation date of scheme

9 October 2008

End date of entry into scheme

30 June 2010 (originally set at 31st October 2009)

Fee for instrument

Depending on the length:

(i) for instruments with a maturity of less than a month, as well as for a maximum amount of €4 billion for the callable deposits (in particular by fiduciaries): 25 bps

(ii) for instruments with a maturity less than twelve months inclusive, including instruments with no fixed maturity: 50 bps

(iii) for instruments with maturity strictly longer than one year: 50 bps plus the minmum of: the median of the Dexia 5-year CDS spread calculated on the period beginning 1 Jan 2007 and ending 31 Aug 2008 (provided that these spreads are representative); the median of the 5-year CDS spread of all credit institutions with a long-term credit rating equivalent of that of Dexia, calculated over the same period

From 1 March 2010, an additional remuneration, calculated on a pro rata basis, was due on any amounts that exceed €60 billion as follows:

(i) 50 bps per annum (on a pro rata basis) on the amount of the Guarantee Agreement between €60-70 billion

(ii) 65 bps per annum (on a pro rata basis) on the amount of the Guarantee Agreement between €70-80 billion

(iii) 80 bps per annum (on a pro rata basis) on the amount of the Guarantee Agreement between €80-100 billion

Maximum tenor

4 years

Institution criteria

The Scheme was only available to Dexia SA, Dexia Banque Internationale a Luxembourg S.A., Dexia Banque Belgique and Dexia Credit Local S.A.

[36] For details see:
http://www.dexia.com/docs/2008/2008_news/20081209_gov_02_UK.pdf;
http://www.dexia.com/docs/2010/2010_services/20100416_Avenant17mars_UK.pdf;
http://ec.europa.eu/competition/state_aid/cases/227704/227704_944159_114_1.pdf.

Instrument eligibility

Securities or financial instruments with the unit face value of at least €25,000, including bonds and medium term bonds

Scale of scheme

€100 billion (originally set at €150 billion)

A1.2.2 Guarantee agreement between the Belgian, Dutch and Luxembourg State and Fortis Bank[37]

Implementation date of scheme

5 November 2008

End date of entry into scheme

31 October 2009

Fee for instrument

(i) For contracts, securities and financial instruments with a maturity of under one month: 25 bps
(ii) For financing which will mature within one year or which has indefinite maturity: 50 bps
(iii) For financing with a maturity strictly exceeding one year the fee is 50 bps plus the lower of either the median value of the Fortis Bank 5 years CDS spreads over the period beginning on 1 Jan 2007 and ending on 31 Aug 2008 (provided that these spreads are representative); or the median of the 5 years CDS spreads of all credit institutions with a long-term credit rating equivalent of that of Fortis Bank.

Maximum tenor

3 years

Institution criteria

The Scheme was only available to Fortis Bank

Instrument eligibility

Short and medium term wholesale funding, including commercial papers, bonds and medium-term notes excluding mortgage bonds and similar certificates and loans with a statutory line or contractual mechanism which serves the same purpose, subordinate loans, securities and financial instruments, hybrid capital and capital securities and financial instruments, and all derivatives

Scale of scheme

€150 million

[37] For details see:
http://europa.eu/rapid/pressReleasesAction.do?reference=IP/08/1746&format=HTML&aged=0&language=EN&guiLanguage=en;
www.mayerbrown.com/public_docs/0209fin_Belgium.pdf;
http://ec.europa.eu/competition/state_aid/cases/228379/228379_1018353_32_1.pdf.

Annex 2 Comparison of SG and non-SG bond populations

A2.1 Data availability

Table 25 considers data availability for issuing cost measures by country of risk and for SG and non-SG bonds. The main finding is that a greater amount of data is available for SG bonds than non-SG bonds and in certain countries. This is to be expected because it reflects the patterns of issuance activity at the time. Issuing cost data is also missing for a number of bonds. This issue is considered in Annex 3.

Table 25: Data availability, number of observations, by country of risk

	z-spread/zero discount margin[1]		z-spread/zero discount margin[2]	
	SG	Non-SG	SG	Non-SG
AT	18	0	18	0
BE	3	1	5	1
DE	136	5	144	7
DK	83	13	82	13
ES	63	29	68	32
IE	19	-	21	-
FR	32	-	36	-
NL	22	78	26	78
PT	5	3	5	3
SE	24	60	28	63
SI	6	1	6	1
UK	98	8	102	8

Table 26 provides a comparison of means of issuing cost measures by country of risk and for SG and non-SG bonds. The raw data revealed a large range of values. Bonds with extreme issuing costs of more than the 95th percentile were dropped as they most likely reflected bond characteristics outside the scope of the analysis and reporting errors. For example, in Portugal the average z-spread was is in the order of 400 bps. To prevent this problem, issuing cost data was cleaned insofar as observations above the 95th percentile were excluded from the econometric analysis.

Table 26: Comparison of means, z-spread/zero discount margin, by country of risk

	z-spread/zero discount margin[1]		z-spread/zero discount margin[2]	
	SG	Non-SG	SG	Non-SG
AT	46.3	-	47.9	-
BE	81.9	48.0	64.2	48.0
DE	9.6	40.6	9.7	57.3
DK	21.6	77.6	21.4	77.6
ES	213.5	163.3	203.6	168.0
IE	438.8	-	423.4	-
NL	34.0	59.8	38.5	59.9
PT	103.9	433.0	108.2	434.7
SE	13.0	70.4	21.5	71.5
SI	96.4	86.2	96.9	86.2
UK	20.1	75.3	21.1	75.3

Note: [1]CBBT pricing source, [2]BGN pricing source, - indicates all non-SG bonds were ineligible for a state guarantee
Source: Bloomberg

A2.2 Determinants of issuing cost data

A2.2.1 Data availability

Table 27 shows data availability for determinants of issuing costs by country of risk and for SG and non-SG bonds. The main observation is that the vast majority of data is available.

Table 27: Data availability, % of total sample, by country of risk

	Amount issued		Coupon		Maximum tenor		CDS spread		Cross default clause		Force majeure clause		Negative pledge clause		Private placement		Grace period	
	SG	Non-SG	SG	Non-SG	SG	Non-SG	SG	Non-SG	SG	Non-SG	SG	Non-SG	SG	Non-SG	SG	Non-SG	SG	Non-SG
AT	100%	99%	100%	100%	100%	100%	21%	1%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%
BE	100%	100%	100%	78%	100%	100%	0%	62%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%
DE	100%	100%	99%	100%	100%	100%	5%	51%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%
DK	100%	100%	100%	100%	100%	100%	10%	27%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%
ES	100%	100%	100%	100%	100%	100%	19%	61%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%
GR	100%	100%	100%	95%	100%	100%	42%	68%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%
LU	100%	100%	100%	78%	100%	100%	0%	17%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%
NL	100%	100%	100%	60%	100%	100%	87%	96%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%
PT	100%	100%	100%	100%	100%	100%	50%	92%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%
SE	100%	99%	100%	100%	100%	100%	92%	66%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%
SI	100%	100%	100%	100%	100%	100%	0%	0%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%
UK	100%	95%	100%	95%	100%	100%	94%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%
Total	**100%**	**99%**	**100%**	**91%**	**100%**	**100%**	**42%**	**62%**	**100%**	**100%**	**100%**	**100%**	**100%**	**100%**	**100%**	**100%**	**100%**	**100%**

Source: Bloomberg

A2.2.2 Comparison of means

The comparison of means presented in Table 28 gives a sense of the characteristics of SG and non-SG bonds by country of risk. The nature of SG bonds is fairly different to non-SG bonds in terms of the amounts issued. On average, the value of the SG bond issues were far larger than those of the issues of non-SG bonds. Otherwise, however, these bonds were similar in terms of the coupon, maximum tenor and other contractual feature. Both of these findings are to be expected to some extent. Contractual features are similar because the comparison group of bonds was selected explicitly on the basis of state guarantee scheme eligibility criteria. And, differences in amounts issued reflect wholesale funding market conditions.[38]

Table 28: Comparison of means, by country of risk

	Amount issued (€m)		Coupon (%)		Maximum tenor (yrs)		CDS spread (bps)		Cross default clause†		Force majeure clause†		Negative pledge clause†		Private placement†		Grace period (days)	
	SG	Non-SG	SG	Non-SG	SG	Non-SG	SG	Non-SG	SG	Non-SG	SG	Non-SG	SG	Non-SG	SG	Non-SG	SG	Non-SG
AT	859.3	27.4	3	4	3.3	3.9	120	120	0.00	0.00	0.00	0.00	0.00	0.8	0.00	0.08	15	0
BE	1499	48	2	2	2.5	2.0	0	191	0.10	0.00	0.00	0.00	0.1	0.00	0.44	0.16	2	13
DE	392	58	2	3	3.3	2.7	261	135	0.00	0.00	0.00	0.002	0.00	0.00	0.004	0.002	2	19
DK	723	733	2	3	3.0	2.7	112	112	0.02	0.00	0.01	0.02	0.02	0.00	0.07	0.22	1	1
EL	1989	209	6	3	2.8	2.3	898	663	0.29	0.00	0.00	0.00	0.17	0.00	0.00	0.00	4	3
ES	352	496	3	4	3.3	3.1	378	282	0.00	0.00	0.01	0.01	0.00	0.00	0.11	0.06	0	0
LU	14	13	2	2	2.3	2.0	0	147	0.03	0.00	0.00	0.00	0.03	0.00	0.00	0.00	11	0
NL	1253	21	2	4	4.1	3.0	158	156	0.00	0.00	0.00	0.002	0.17	0.01	0.27	0.05	10	15
PT	813	153	3	3	3.0	3.0	559	564	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.46	7	0
SE	732	721	2	2	3.2	3.1	88	73	0.00	0.00	0.00	0.00	0.00	0.00	0.19	0.10	25	7
SI	510	37	3	5	4.0	5.0	0	0	0.04	0.00	0.00	0.00	0.06	0.00	0.00	0.00	3	0
UK	1129	40	2	1	2.7	2.7	157	96	0.00	0.00	0.00	0.00	0.00	0.01	0.23	0.10	7	1
Total	**686**	**75**	**2**	**4**	**3.1**	**2.9**	**327**	**151**	**0.04**	**0.00**	**0.002**	**0.003**	**0.04**	**0.006**	**0.11**	**0.05**	**5**	**15**

Source: Bloomberg

[38] The validity of the econometric analysis is not undermined as a result of sizeable differences in the value of SG versus non-SG bonds because amounts issued are controlled for explicitly in the econometric analysis.

Annex 3 Analysis of missing issuing cost data

This section provides an analysis of differences in bond characteristics between bonds 'included' in the empirical analysis of the impact of state guarantees on issuing cost and related questions (i.e., bonds for which the main issuing cost measure is available) and bonds 'excluded' from the empirical analysis (i.e., bonds for which the main issuing cost measure is missing).

The analysis shows that the main results are robust to missing issuing cost data. That is, despite missing issuing cost data:

i. *The characteristics of included and excluded bonds are generally similar enough to instil confidence that had issuing cost data on excluded bonds been available the main findings on the impact of state guarantees on issuing costs (hereafter, 'the main findings') would still hold.* Mean-comparison tests/tests of proportions for bond characteristics (e.g. bond ratings) showed that included and excluded bonds are similar and therefore, the exclusion of bonds for which issuing cost data was unavailable is unlikely to have influenced the main findings.

ii. *In cases where the characteristics of included and excluded observations differ, differences are not of economic significance.* Included and excluded non-SG bonds did differ in terms of issuance volume. Namely, excluded non-SG bonds were larger than included non-SG bonds. However, these differences are not economically significant. The main findings are robust to subsamples of smaller and larger bonds. The included banks are representative of the bank population. And, the main findings are robust to re-estimation on the basis of imputed data.

The evidence presented in the following sections supports the two points made above.

A3.1 Differences between included and excluded bonds

A3.1.1 State guaranteed bonds

Table 29 provides descriptive statistics on included excluded SG bonds (for which issuing cost data are non-missing and missing, respectively).

For each variable included in the main empirical specification for the impact of state guarantees on issuing cost, information on the distributional characteristics of included and excluded bonds are displayed. This includes information on number of observations, means, standard deviations and quantiles.

One of notable features of these data is that the means across included and excluded bonds for some variables differs. The amount issued for instance is higher for included bonds (€71m) than excluded bonds (€33m).

To investigate these differences formally, mean-comparison tests and comparisons of proportions were undertaken, the results of which are displayed in Table 30, Table 31, and Table 32 (pp. 144-146).

Table 29: Descriptive statistics for SG bonds with missing (excluded) and non-missing (included) issuing cost data

					Quantiles				
Variable	**Group**	**N**	**Mean**	**S.D.**	**Min**	**.25**	**Mdn**	**.75**	**Max**
Issuance volume	Included	554	7.1E+8	9.0E+8	7.3E+6	7.3E+7	2.8E+8	1.0E+9	4.8E+9
	Excluded	434	3.3E+8	5.3E+8	3.4E+6	5.0E+7	1.1E+8	3.6E+8	3.3E+9
Coupon	Included	549	2.07	1.41	0.17	1.05	1.71	2.75	9.53
	Excluded	428	2.49	1.20	0.00	1.71	2.42	3.07	10.00
Bond rating	Included	554	0.42	0.49	0.00	0.00	0.00	1.00	1.00
	Excluded	434	0.27	0.44	0.00	0.00	0.00	1.00	1.00
Time to maturity	Included	554	3.03	0.97	1.00	2.00	3.00	3.00	5.00
	Excluded	434	2.86	1.20	0.00	2.00	3.00	3.00	5.00
Sovereign CDS	Included	554	72.38	132.07	0.00	24.91	25.43	32.66	628.36
	Excluded	434	128.92	189.04	0.00	24.91	25.43	208.13	628.36
Private placement	Included	554	0.08	0.28	0.00	0.00	0.00	0.00	1.00
	Excluded	434	0.15	0.36	0.00	0.00	0.00	0.00	1.00
USD-denominated	Included	554	0.24	0.43	0.00	0.00	0.00	0.00	1.00
	Excluded	434	0.18	0.38	0.00	0.00	0.00	0.00	1.00
Non-USD-denomainted	Included	554	0.23	0.42	0.00	0.00	0.00	0.00	1.00
	Excluded	434	0.25	0.43	0.00	0.00	0.00	0.00	1.00
Variable interest rate	Included	554	0.78	0.42	0.00	1.00	1.00	1.00	1.00
	Excluded	434	0.28	0.45	0.00	0.00	0.00	1.00	1.00

Note: S.D. (standard deviation), Min (minimum), 0.25 (25^{th} percentile), Mdn (median), 0.75 (75^{th} percentile), Max (maximum)

Table 34-Table 36 show the results of mean-comparison tests and tests of proportions of the characteristics of included and excluded bonds, by month

The rationale for these comparisons was to formally investigate differences in included and excluded bond characteristics to determine whether they may have influenced the main findings of the study in relation to issuing cost.

The statistical tests are conducted on a monthly basis because the main empirical specification includes time dummies, which account for inter-month variation, and therefore we are interested in unaccounted for intra-month variation between included and excluded bonds.

The tables display number of observations (N_1, N_2), means (μ_1, μ_2), differences in means (μ_1-μ_2), the test statistic determining whether differences in means are statistically significant (t-stat/z-stat) and the standard error used in the test (SE).

The t-stat/z-stat column of the summary row provides the main output of this analysis. It indicates the number of months in which the characteristic of included and excluded bonds are different at a statistically significant level.

The main finding is that included and excluded bond characteristics are similar in the vast majority of months. In terms of issuance volume, bond and time to maturity, bonds are different in only a minority of months (at most, four out of 26).

The only way in which included and excluded bonds are different is in terms of interest rate type. This was seen above, where 78% of included bonds had a variable interest rate, whereas this was only the case for 28% of excluded bonds. The remainder of bonds had either a fixed, floating or other interest rate. This finding is corroborated below, as included and excluded bonds differ in 20 out of the 26 months for which the two proportions were compared.

Table 30: Comparison of means for missing and non-missing SG bonds (1 of 3)

	Issuance volume							Coupon							Bond rating						
Mth	N_1	N_2	μ_1	μ_2	μ_1-μ_2	t-stat	SE	N_1	N_2	μ_1	μ_2	μ_1-μ_2	t-stat	SE	N_1	N_2	μ_1	μ_2	μ_1-μ_2	z-stat	SE
11/08	13	3	2.0E+9	6.7E+8	1.3E+9	-0.5	8.0E+8	13	3	4.1	4.5	-0.4	-1.3	0.4	13	3	0.9	1.0	-0.1	-0.5	0.1
12/08	19	12	1.1E+9	3.1E+8	8.3E+8	2	2.3E+8	19	12	3.2	2.4	0.7	1.7	0.4	19	12	0.7	0.3	0.4	1.9	0.2
01/09	20	8	9.8E+8	2.4E+8	7.4E+8	1.9	3.6E+8	19	8	2.5	2.5	0.1	0.3	0.3	20	8	0.8	0.4	0.4	1.9	0.2
02/09	29	20	1.1E+9	2.0E+8	8.7E+8	2	2.1E+8	29	20	2.7	3	-0.3	-1.4	0.2	29	20	0.6	0.3	0.3	2.0	0.1
03/09	36	27	1.2E+9	4.3E+8	8.0E+8	1.5	2.4E+8	36	27	2.6	2.5	0.2	0.9	0.2	36	27	0.6	0.4	0.2	1.5	0.1
04/09	34	31	7.7E+8	6.0E+8	1.6E+8	1.1	2.1E+8	34	31	2.4	2.1	0.3	1.7	0.2	34	31	0.6	0.4	0.1	1.1	0.1
05/09	32	40	8.3E+8	3.6E+8	4.7E+8	0.4	2.0E+8	32	40	2.1	1.9	0.1	0.7	0.2	32	40	0.5	0.5	0.1	0.4	0.1
06/09	30	64	5.1E+8	2.2E+8	2.9E+8	2.4	10E+7	30	64	1.7	2.5	-0.8	-4.5	0.2	30	64	0.3	0.1	0.2	2.4	0.1
07/09	33	26	6.0E+8	2.6E+8	3.4E+8	1.3	1.7E+8	33	26	1.4	2.4	-0.9	-4.4	0.2	33	26	0.6	0.5	0.2	1.3	0.1
08/09	20	6	4.1E+8	4.4E+8	-3.1E+7	0.1	2.2E+8	20	6	0.9	2.4	-1.4	-5.7	0.3	20	6	0.7	0.7	0.0	0.2	0.2
09/09	14	5	6.3E+8	7.4E+8	-1.2E+8	0.1	5.2E+8	14	5	1.7	2.1	-0.3	-0.4	0.8	14	5	0.4	0.4	0.0	0.1	0.3
10/09	16	10	7.6E+8	4.8E+8	2.8E+8	3.7	2.5E+8	16	10	1.2	2.8	-1.7	-3.5	0.5	16	10	0.8	0.2	0.6	3.1	0.2
11/09	14	17	6.4E+8	3.8E+8	2.6E+8	2.5	2.2E+8	14	17	1.9	2.7	-0.8	-1.7	0.5	14	17	0.7	0.3	0.4	2.3	0.2
12/09	16	7	3.6E+8	6.2E+8	-2.6E+8	0	1.7E+8	16	7	1.1	2.8	-1.7	-7.6	0.2	16	7	0.6	0.6	0.0	0.0	0.2
01/10	21	14	7.9E+8	3.8E+8	4.0E+8	1	2.6E+8	21	14	1.2	2.3	-1.1	-3.2	0.3	21	14	0.5	0.4	0.2	1.0	0.2
02/10	14	14	8.2E+8	1.0E+8	7.2E+8	2.1	2.7E+8	14	13	1.1	2.2	-1.2	-3.3	0.4	14	14	0.5	0.1	0.4	2.0	0.2
03/10	28	30	3.6E+8	2.4E+8	1.1E+8	0.1	1.2E+8	28	27	1.4	2	-0.7	-2.4	0.3	28	30	0.1	0.1	0.0	0.1	0.1
04/10	25	30	7.5E+8	2.6E+8	5.0E+8	-0.4	1.8E+8	25	29	1.8	2.3	-0.5	-1.5	0.3	25	30	0.0	0.1	0.0	-0.4	0.1
05/10	32	11	3.2E+8	1.9E+8	1.3E+8	-0.5	1.3E+8	32	10	2.1	2.2	-0.1	-0.2	0.5	32	11	0.1	0.2	-0.1	-0.5	0.1
06/10	43	19	5.0E+8	1.0E+8	4.0E+8	1.2	2.2E+8	41	19	2	2.5	-0.5	-1.3	0.4	43	19	0.1	0.0	0.1	1.2	0.0
07/10	25	3	1.3E+8	1.7E+8	-4.1E+7	-3.4	6.8E+7	24	3	1.3	1.5	-0.2	-1.2	0.2	25	3	0.0	0.3	-0.3	-2.9	0.3
08/10	6	7	3.2E+8	3.3E+8	-4.4E5	0.7	2.4+E8	6	7	1.9	2.9	-1	-0.7	1.4	6	7	0.5	0.3	0.2	0.8	0.3
09/10	8	6	1.3E+8	1.3E+8	-1.9E6	-0.2	6.7E+7	8	6	1.7	2.6	-1	-1.1	0.8	8	6	0.1	0.2	0.0	-0.2	0.2
10/10	5	7	2.6E+8	3.6E+8	-9.6E+7	-0.3	1.9E+8	5	7	0.8	3.2	-2.4	-3.1	0.8	5	7	0.2	0.3	-0.1	-0.3	0.2
11/10	6	9	2.4E+8	5.4E+8	-3.0E+8	.	3.6E+8	6	9	4.5	3.5	1	1.2	0.8	6	9	0.0	0.0	0.0	.	0.0
12/10	8	5	2.4E+9	6.5E+8	1.7E+9	0.8	8.1E+8	7	5	7.7	5.5	2.2	1.5	1.5	8	5	0.1	0.0	0.1	0.8	0.1
Summ.	**547**	**431**	**7.3E+8**	**3.6E+8**	**3.6E+8**	**4**	**.**	**542**	**425**	**2.2**	**2.7**	**-4.8E-1**	**0**	**.**	**547**	**431**	**4.2E-1**	**3.1E-1**	**1.3E-1**	**3**	**.**

Note: Mth (month), N (number of observations), μ (mean), t-stat (outcome of t-test for continuous variables based on mean-comparison tests), z-stat (outcome of tests of proportions for indicator variables), SE (standard error), subscript 1 indicates statistic relates to included bonds and subscript 2 indicates statistic relates to excluded bonds

Table 31: Comparison of means for missing and non-missing SG bonds (2 of 3)

	Time to maturity							Sovereign CDS							Private placement						
Mth	N_1	N_2	μ_1	μ_2	μ_1-μ_2	t-stat	SE	N_1	N_2	μ_1	μ_2	μ_1-μ_2	t-stat	SE	N_1	N_2	μ_1	μ_2	μ_1-μ_2	z-stat	SE
11/08	13	3	2.9	2.7	0.3	1.2	0.2	13	3	32.7	27.5	5.2	4.8	1.1	13.0	3.0	0.0	0.0	0.0	.	0.0
12/08	19	12	2.8	3.3	-0.5	-1.8	0.3	19	12	61.5	22.8	38.7	1	39.2	19.0	12.0	0.1	0.1	0.0	0.2	0.1
01/09	20	8	2.9	3	-0.2	-0.5	0.3	20	8	86.6	16.3	70.3	1.1	65	20.0	8.0	0.1	0.3	-0.2	-1.5	0.2
02/09	29	20	3	2.7	0.4	1.5	0.3	29	20	72.5	27.4	45.1	1.6	28.7	29.0	20.0	0.1	0.2	0.0	-0.5	0.1
03/09	36	27	3.3	2.3	0.9	4.2	0.2	36	27	74.2	77.3	-3.1	-0.1	21	36.0	27.0	0.1	0.1	0.0	-0.4	0.1
04/09	34	31	3.3	2.3	1	4.6	0.2	34	31	70.6	43.4	27.1	1.5	18	34.0	31.0	0.1	0.2	-0.2	-1.9	0.1
05/09	32	40	3	2.3	0.8	2.9	0.3	32	40	79.3	79.8	-0.5	0	28.3	32.0	40.0	0.1	0.2	-0.1	-1.4	0.1
06/09	30	64	2.6	2.7	-0.1	-0.7	0.2	30	64	69.8	108	-38.2	-1.8	20.9	30.0	64.0	0.2	0.1	0.1	1.0	0.1
07/09	33	26	3.1	2.9	0.2	0.8	0.3	33	26	51.7	65.1	-13.5	-0.7	18.3	33.0	26.0	0.1	0.2	-0.1	-1.2	0.1
08/09	20	6	2.9	3	-0.1	-0.2	0.5	20	6	26.7	24.6	2	0.3	6.6	20.0	6.0	0.2	0.5	-0.3	-1.5	0.2
09/09	14	5	2.9	2.8	0.1	0.1	0.5	14	5	55.3	66.4	-11.1	-0.3	36.5	14.0	5.0	0.1	0.2	-0.1	-0.3	0.2
10/09	16	10	2.8	3.2	-0.4	-0.9	0.4	16	10	52.2	161.5	-109.3	-2.2	50	16.0	10.0	0.1	0.1	0.0	-0.3	0.1
11/09	14	17	3.8	3.6	0.1	0.3	0.5	14	17	50.1	101.4	-51.3	-1.7	29.6	14.0	17.0	0.1	0.3	-0.2	-1.6	0.1
12/09	16	7	3.4	4.7	-1.3	-2.4	0.5	16	7	95.7	103.7	-8	-0.2	41.8	16.0	7.0	0.1	0.4	-0.3	-1.6	0.2
01/10	21	14	3	3.4	-0.4	-1.1	0.4	21	14	55.3	33.7	21.6	0.6	38.7	21.0	14.0	0.1	0.1	0.1	0.7	0.1
02/10	14	14	3.2	3.1	0.1	0.3	0.5	14	14	118.9	264.9	-146	-1.5	97.3	14.0	14.0	0.1	0.3	-0.2	-1.5	0.1
03/10	28	30	3.1	3.1	0	0.1	0.3	28	30	163.9	315	-151.1	-2.1	71	28.0	30.0	0.1	0.1	-0.1	-0.8	0.1
04/10	25	30	3.2	3.1	0.1	0.2	0.3	25	30	84	321.2	-237.2	-3.5	67.4	25.0	30.0	0.1	0.2	0.0	-0.5	0.1
05/10	32	11	2.9	3.5	-0.5	-1.6	0.3	32	11	43.6	74	-30.3	-1.2	24.5	32.0	11.0	0.0	0.1	-0.1	-1.7	0.1
06/10	43	19	3	3.3	-0.2	-0.9	0.3	43	19	35.1	135.8	-100.8	-4	25.3	43.0	19.0	0.1	0.1	0.0	0.3	0.1
07/10	25	3	2.9	3.7	-0.8	-2.4	0.3	25	3	26.9	25.3	1.6	0.4	4.5	25.0	3.0	0.0	0.0	0.0	0.4	0.0
08/10	6	7	3.5	2.6	0.9	1.1	0.8	6	7	226.1	283.5	-57.5	-0.3	176.7	6.0	7.0	0.0	0.0	0.0	.	0.0
09/10	8	6	2.9	1.7	1.2	1.5	0.8	8	6	251.3	226.1	25.2	0.1	168.5	8.0	6.0	0.0	0.0	0.0	.	0.0
10/10	5	7	2.8	3.6	-0.8	-1.1	0.7	5	7	24.9	309.7	-284.8	-2.1	138.3	5.0	7.0	0.0	0.0	0.0	.	0.0
11/10	6	9	2.5	3.1	-0.6	-0.9	0.7	6	9	332.4	170.6	161.8	1.2	133.5	6.0	9.0	0.2	0.0	0.2	1.3	0.2
12/10	8	5	2.9	0.8	2.1	6.3	0.3	8	5	6.3	256.3	-250	-2.1	116.9	8.0	5.0	0.0	0.0	0.0	.	0.0
Summ.	**547**	**431**	**3.0E+0**	**2.9E+0**	**8.9E-2**	**4**		**547**	**431**	**8.6E+1**	**1.3E+2**	**-4.2E+1**	**1**		**547**	**431**	**8.5E-2**	**1.5E-1**	**-5.8E-2**	**0**	**547**

Note: Mth (month), N (number of observations), μ (mean), t-stat (outcome of t-test for continuous variables based on mean-comparison tests), z-stat (outcome of tests of proportions for indicator variables), SE (standard error), subscript 1 indicates statistic relates to included bonds and subscript 2 indicates statistic relates to excluded bonds

Table 32: Comparison of means for missing and non-missing SG bonds (3 of 3)

	USD-denominated							Non-USD-denominated							Variable interest rate						
Mth	N_1	N_2	μ_1	μ_2	μ_1-μ_2	z-stat	SE	N_1	N_2	μ_1	μ_2	μ_1-μ_2	z-stat	SE	N_1	N_2	μ_1	μ_2	μ_1-μ_2	z-stat	SE
11/08	13.0	3.0	0.1	0.0	0.1	0.5	0.1	13.0	3.0	0.5	0.0	0.5	1.5	0.1	13.0	3.0	0.5	0.0	0.5	1.7	0.1
12/08	19.0	12.0	0.3	0.2	0.1	0.9	0.2	19.0	12.0	0.4	0.3	0.0	0.2	0.2	19.0	12.0	0.7	0.3	0.4	1.9	0.2
01/09	20.0	8.0	0.3	0.0	0.3	1.7	0.1	20.0	8.0	0.4	0.5	-0.2	-0.7	0.2	20.0	8.0	0.7	0.1	0.5	2.5	0.2
02/09	29.0	20.0	0.3	0.3	0.1	0.5	0.1	29.0	20.0	0.2	0.4	-0.1	-1.1	0.1	29.0	20.0	0.5	0.3	0.2	1.5	0.1
03/09	36.0	27.0	0.3	0.2	0.1	0.9	0.1	36.0	27.0	0.1	0.2	-0.1	-1.2	0.1	36.0	27.0	0.5	0.5	0.0	-0.1	0.1
04/09	34.0	31.0	0.3	0.4	-0.1	-1.1	0.1	34.0	31.0	0.1	0.3	-0.3	-2.7	0.1	34.0	31.0	0.7	0.5	0.3	2.1	0.1
05/09	32.0	40.0	0.2	0.3	-0.1	-0.9	0.1	32.0	40.0	0.2	0.3	-0.1	-0.6	0.1	32.0	40.0	0.6	0.7	0.0	-0.2	0.1
06/09	30.0	64.0	0.5	0.2	0.3	3.2	0.1	30.0	64.0	0.0	0.2	-0.1	-1.9	0.1	30.0	64.0	0.9	0.2	0.6	5.8	0.1
07/09	33.0	26.0	0.2	0.2	0.1	0.8	0.1	33.0	26.0	0.1	0.2	-0.1	-1.1	0.1	33.0	26.0	0.8	0.3	0.6	4.5	0.1
08/09	20.0	6.0	0.7	0.7	0.0	-0.1	0.2	20.0	6.0	0.0	0.0	0.0	.	0.0	20.0	6.0	1.0	0.0	1.0	4.6	0.0
09/09	14.0	5.0	0.3	0.2	0.1	0.4	0.2	14.0	5.0	0.0	0.0	0.0	.	0.0	14.0	5.0	0.6	0.0	0.6	2.5	0.1
10/09	16.0	10.0	0.6	0.4	0.2	0.8	0.2	16.0	10.0	0.1	0.1	0.0	-0.3	0.1	16.0	10.0	0.7	0.0	0.7	3.5	0.1
11/09	14.0	17.0	0.3	0.2	0.1	0.7	0.2	14.0	17.0	0.2	0.1	0.1	0.7	0.1	14.0	17.0	0.5	0.1	0.4	2.8	0.1
12/09	16.0	7.0	0.3	0.3	0.0	-0.2	0.2	16.0	7.0	0.2	0.0	0.2	1.2	0.1	16.0	7.0	0.8	0.0	0.8	3.6	0.1
01/10	21.0	14.0	0.2	0.1	0.0	0.4	0.1	21.0	14.0	0.1	0.1	0.0	0.0	0.1	21.0	14.0	0.9	0.1	0.7	4.2	0.1
02/10	14.0	14.0	0.3	0.1	0.1	0.9	0.2	14.0	14.0	0.0	0.4	-0.4	-2.5	0.1	14.0	14.0	0.9	0.4	0.4	2.4	0.2
03/10	28.0	30.0	0.2	0.2	0.0	0.1	0.1	28.0	30.0	0.3	0.2	0.1	0.5	0.1	28.0	30.0	1.0	0.3	0.7	5.4	0.1
04/10	25.0	30.0	0.2	0.1	0.0	0.3	0.1	25.0	30.0	0.2	0.3	-0.1	-0.8	0.1	25.0	30.0	0.9	0.1	0.7	5.5	0.1
05/10	32.0	11.0	0.1	0.0	0.1	0.8	0.0	32.0	11.0	0.5	0.4	0.1	0.6	0.2	32.0	11.0	0.9	0.3	0.7	4.5	0.1
06/10	43.0	19.0	0.1	0.0	0.1	1.4	0.0	43.0	19.0	0.5	0.4	0.1	0.9	0.1	43.0	19.0	1.0	0.3	0.7	6.4	0.1
07/10	25.0	3.0	0.1	0.0	0.1	0.5	0.1	25.0	3.0	0.8	0.7	0.1	0.4	0.3	25.0	3.0	1.0	0.7	0.3	2.9	0.3
08/10	6.0	7.0	0.3	0.0	0.3	1.7	0.2	6.0	7.0	0.2	0.4	-0.3	-1.0	0.2	6.0	7.0	0.5	0.0	0.5	2.1	0.2
09/10	8.0	6.0	0.1	0.2	0.0	-0.2	0.2	8.0	6.0	0.1	0.5	-0.4	-1.5	0.2	8.0	6.0	1.0	0.2	0.8	3.2	0.2
10/10	5.0	7.0	0.4	0.0	0.4	1.8	0.2	5.0	7.0	0.2	0.3	-0.1	-0.3	0.2	5.0	7.0	0.8	0.3	0.5	1.8	0.2
11/10	6.0	9.0	0.0	0.0	0.0	.	0.0	6.0	9.0	0.3	0.1	0.2	1.1	0.2	6.0	9.0	0.5	0.0	0.5	2.4	0.2
12/10	8.0	5.0	0.0	0.0	0.0	.	0.0	8.0	5.0	0.1	0.2	-0.1	-0.4	0.2	8.0	5.0	0.9	0.0	0.9	3.1	0.1
Summ.	**547**	**431**	**2.58E-1**	**1.7E-1**	**9.2E-2**	**1**		**547**	**431**	**2.2E-1**	**2.5E-1**	**-3.9E-2**	**0**		**547**	**431**	**7.6E-1**	**2.2E-1**	**5.4E-1**	**20**	

Note: Mth (month), N (number of observations), μ (mean), t-stat (outcome of t-test for continuous variables based on mean-comparison tests), z-stat (outcome of tests of proportions for indicator variables), SE (standard error), subscript 1 indicates statistic relates to included bonds and subscript 2 indicates statistic relates to excluded bonds

A3.1.2 Non-state guaranteed bonds

Table 33 provides descriptive statistics on included excluded non-SG bonds, as per Table 29 in the section above. And similarly, Table 32-Table 34 shows the results of mean-comparison tests and tests of proportions of the characteristics of included and excluded bonds, by month.

Focusing on Table 32-Table 34, we observe that in the majority of months (18 of 26), the issuance volume of included bonds is smaller than the issuance volume of excluded bonds. Moreover, included bonds are more likely to yield a variable interest rate than excluded bonds (in 18 of 26 months).

The findings of this and the previous section are considered in more detail below.

Table 33:Analysis of missing data – non-SG bonds

					Quantiles				
Variable	**Group**	**N**	**Mean**	**S.D.**	**Min**	**.25**	**Mdn**	**.75**	**Max**
Issuance volume	Included	208	4.4E+8	5.6E+8	6.7E+5	2.2E+7	1.0E+8	9.7E+8	2.0E+9
	Excluded	1476	5.9E+7	1.8E+8	9864.29	5.0E+6	1.6E+7	5.0E+7	3.0E+9
Coupon	Included	206	2.14	1.28	0.24	1.20	1.91	2.98	10.25
	Excluded	1318	2.89	2.96	0.00	1.50	2.50	3.50	49.00
Bond rating	Included	208	0.02	0.14	0.00	0.00	0.00	0.00	1.00
	Excluded	1483	0.00	0.04	0.00	0.00	0.00	0.00	1.00
Time to maturity	Included	208	2.72	1.13	1.00	2.00	3.00	3.00	5.00
	Excluded	1483	2.39	1.14	0.00	2.00	2.00	3.00	5.00
Sovereign CDS	Included	208	5.85	33.10	0.00	0.00	0.00	0.00	208.13
	Excluded	1483	5.23	28.94	0.00	0.00	0.00	0.00	208.13
Private placement	Included	208	0.09	0.28	0.00	0.00	0.00	0.00	1.00
	Excluded	1483	0.05	0.21	0.00	0.00	0.00	0.00	1.00
USD-denominated	Included	208	0.16	0.37	0.00	0.00	0.00	0.00	1.00
	Excluded	1483	0.14	0.35	0.00	0.00	0.00	0.00	1.00
Non-USD-denominated	Included	208	0.11	0.31	0.00	0.00	0.00	0.00	1.00
	Excluded	1483	0.18	0.39	0.00	0.00	0.00	0.00	1.00
Variable interest rate	Included	208	0.72	0.45	0.00	0.00	1.00	1.00	1.00
	Excluded	1483	0.28	0.45	0.00	0.00	0.00	1.00	1.00

Table 34: Comparison of means and proportions for missing and non-missing non-SG bonds (1 of 3)

	Issuance volume							Coupon							Bond rating						
Mth	N_1	N_2	μ_1	μ_2	μ_1-μ_2	t-stat	SE	N_1	N_2	μ_1	μ_2	μ_1-μ_2	t-stat	SE	N_1	N_2	μ_1	μ_2	μ_1-μ_2	z-stat	SE
11/08	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
12/08	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
01/09	5	54	3.9E+8	5.7E+7	3.3E+8	4.7	7.1E+7	5.0	55.0	2.9	3.6	-0.7	-1.4	0.5	5.0	56.0	0.2	0.0	0.2	3.4	0.2
02/09	3	54	2.4E+7	1.1E+8	-8.4E+7	-0.9	9.5E+7	3.0	52.0	2.7	3.0	-0.3	-0.3	0.9	3.0	55.0	0.0	0.0	0.0	.	0.0
03/09	3	65	8.1E+8	4.7E+7	7.6E+8	8.0	9.5E+7	3.0	53.0	3.8	2.5	1.3	1.6	0.8	3.0	66.0	0.0	0.0	0.0	.	0.0
04/09	3	99	3.7E+7	9.6E+7	-5.9E+7	-0.2	2.5E+8	3.0	85.0	2.7	2.7	0.0	0.0	1.7	3.0	99.0	0.0	0.0	0.0	.	0.0
05/09	9	55	1.1E+9	4.6E+7	1.1E+9	13.1	8.3E+7	9.0	52.0	4.2	2.8	1.4	3.5	0.4	9.0	55.0	0.1	0.0	0.1	2.5	0.1
06/09	8	101	6.3E+8	8.0E+7	5.5E+8	6.3	8.7E+7	8.0	99.0	3.1	3.0	0.1	0.2	0.5	8.0	101.0	0.0	0.0	0.0	-0.5	0.0
07/09	14	77	2.3E+8	5.5E+7	1.8E+8	3.2	5.4E+7	14.0	75.0	2.3	2.6	-0.2	-0.5	0.5	14.0	78.0	0.0	0.0	0.0	.	0.0
08/09	14	45	3.7E+8	4.4E+7	3.2E+8	3.0	1.1E+8	13.0	42.0	2.3	3.3	-1.1	-2.0	0.5	14.0	45.0	0.0	0.0	0.0	.	0.0
09/09	16	59	3.9E+8	7.0E+7	3.2E+8	4.2	7.6E+7	15.0	57.0	1.8	2.9	-1.1	-2.2	0.5	16.0	59.0	0.1	0.0	0.1	1.9	0.1
10/09	14	78	2.8E+8	3.0E+7	2.5E+8	4.8	5.2E+7	14.0	68.0	1.8	2.4	-0.6	-1.0	0.6	14.0	78.0	0.0	0.0	0.0	.	0.0
11/09	14	73	1.6E+8	5.7E+7	1.1E+8	2.0	5.30E+	14.0	66.0	1.6	2.5	-0.9	-1.9	0.5	14.0	73.0	0.0	0.0	0.0	.	0.0
12/09	8	64	1.7E+8	4.1E+7	1.2E+8	4.1	3.0E+7	8.0	59.0	1.9	1.8	0.2	0.3	0.5	8.0	64.0	0.0	0.0	0.0	.	0.0
01/10	12	56	5.7E+8	4.1E+7	5.2E+8	8.3	6.3E+7	12.0	52.0	2.2	4.0	-1.8	-0.7	2.6	12.0	56.0	0.0	0.0	0.0	.	0.0
02/10	6	54	5.9E+8	1.1E+8	4.9E+8	2.8	1.8E+8	6.0	50.0	1.8	1.7	0.1	0.1	0.5	6.0	55.0	0.0	0.0	0.0	.	0.0
03/10	15	64	3.5E+8	6.0E+7	2.9E+8	4.6	6.4E+7	15.0	59.0	1.4	2.2	-0.9	-1.6	0.5	15.0	65.0	0.0	0.0	0.0	.	0.0
04/10	11	45	6.1E+8	6.6E+7	5.4E+8	4.4	1.2E+8	11.0	40.0	1.5	2.0	-0.5	-1.0	0.5	11.0	45.0	0.0	0.0	0.0	.	0.0
05/10	1	30	7.0E+7	7.9E+7	-9.1E+6	.	.	1.0	28.0	0.8	2.2	-1.4	.	.	.	.	.	.	.	.	.
06/10	5	36	3.3E+8	6.4E+7	2.7E+8	3.4	8.0E+7	5.0	32.0	1.6	2.6	-1.1	-0.9	1.2	5.0	36.0	0.0	0.0	0.0	.	0.0
07/10	8	43	4.6E+8	3.1E+7	4.3E+8	4.1	1.0E+8	8.0	36.0	1.5	3.3	-1.9	-1.3	1.4	8.0	43.0	0.0	0.0	0.0	.	0.0
08/10	3	46	5.4E+8	2.9E+7	5.1E+8	9.0	5.6E+7	3.0	38.0	1.3	3.5	-2.2	-0.8	2.6	3.0	46.0	0.0	0.0	0.0	.	0.0
09/10	17	57	5.6E+8	5.2E+7	5.1E+8	7.0	7.3E+7	17.0	50.0	2.2	2.8	-0.6	-0.7	0.8	17.0	57.0	0.0	0.0	0.0	.	0.0
10/10	5	74	2.1E+8	6.4E+7	1.5E+8	1.3	1.1E+8	5.0	58.0	1.4	3.9	-2.5	-1.7	1.5	5.0	74.0	0.0	0.0	0.0	.	0.0
11/10	8	68	3.2E+8	3.9E+7	2.8E+8	5.0	5.7E+7	8.0	53.0	2.1	2.8	-0.7	-0.8	0.8	8.0	68.0	0.1	0.0	0.1	2.9	0.1
12/10	1	76	4.0E+7	2.3E+7	1.7E+7	.	.	1.0	57.0	1.4	5.1	-3.6	.	.	.	.	.	.	.	.	.
Summ.	**203**	**1473**	**3.9E+8**	**5.8E+7**	**3.3E+8**	**18**		**201**	**1316**	**2.1E+0**	**2.9E+0**	**-7.9E-1**	**1**		**201**	**1374**	**2.27E-2**	**0.0E+0**	**2.27E-2**	**3**	

Note: Mth (month), N (number of observations), μ (mean), t-stat (outcome of t-test for continuous variables based on mean-comparison tests), z-stat (outcome of tests of proportions for indicator variables), SE (standard error), subscript 1 indicates statistic relates to included bonds and subscript 2 indicates statistic relates to excluded bonds

Table 35: Comparison of means and proportions for missing and non-missing non-SG bonds (2 of 3)

	Time to maturity							Sovereign CDS							Private placement						
Mth	N_1	N_2	μ_1	μ_2	μ_1-μ_2	t-stat	SE	N_1	N_2	μ_1	μ_2	μ_1-μ_2	t-stat	SE	N_1	N_2	μ_1	μ_2	μ_1-μ_2	z-stat	SE
11/08	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
12/08	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
01/09	5.0	56.0	2.8	3.4	-0.6	-1.6	0.4	5.0	56.0	0.0	0.0	0.0	.	0.0	5.0	56.0	0.0	0.1	-0.1	-0.8	0.0
02/09	3.0	55.0	3.0	3.1	-0.1	-0.3	0.3	3.0	55.0	0.0	0.0	0.0	.	0.0	3.0	55.0	0.0	0.1	-0.1	-0.5	0.0
03/09	3.0	66.0	4.3	2.6	1.7	3.5	0.5	3.0	66.0	0.0	0.0	0.0	.	0.0	3.0	66.0	0.0	0.0	0.0	-0.3	0.0
04/09	3.0	99.0	3.3	2.7	0.6	1.1	0.5	3.0	99.0	0.0	3.6	-3.6	-0.3	11.7	3.0	99.0	0.0	0.0	0.0	-0.2	0.0
05/09	9.0	55.0	3.8	2.8	1.0	2.6	0.4	9.0	55.0	23.1	6.9	16.2	1.3	12.7	9.0	55.0	0.0	0.1	-0.1	-0.8	0.0
06/09	8.0	101.0	3.5	2.7	0.8	2.1	0.4	8.0	101.0	0.0	9.7	-9.7	-0.7	14.3	8.0	101.0	0.0	0.0	0.0	-0.6	0.0
07/09	14.0	78.0	2.4	2.7	-0.3	-1.0	0.3	14.0	78.0	0.0	14.7	-14.7	-1.2	12.0	14.0	78.0	0.1	0.0	0.0	0.9	0.1
08/09	14.0	45.0	2.8	2.9	-0.1	-0.5	0.3	14.0	45.0	0.0	3.2	-3.2	-0.7	4.8	14.0	45.0	0.0	0.0	0.0	.	0.0
09/09	16.0	59.0	3.1	2.9	0.2	0.6	0.3	16.0	59.0	0.0	13.9	-13.9	-1.4	9.6	16.0	59.0	0.2	0.1	0.1	1.8	0.1
10/09	14.0	78.0	3.2	2.8	0.4	1.3	0.3	14.0	78.0	8.4	13.2	-4.8	-0.4	11.4	14.0	78.0	0.1	0.0	0.0	0.6	0.1
11/09	14.0	73.0	2.8	2.8	0.0	0.1	0.3	14.0	73.0	0.0	8.6	-8.6	-0.8	11.2	14.0	73.0	0.2	0.2	0.0	-0.2	0.1
12/09	8.0	64.0	3.5	2.6	0.9	2.6	0.3	8.0	64.0	0.0	3.3	-3.3	-0.4	9.3	8.0	64.0	0.1	0.0	0.1	2.8	0.1
01/10	12.0	56.0	2.3	2.5	-0.2	-0.6	0.3	12.0	56.0	0.0	0.0	0.0	.	0.0	12.0	56.0	0.1	0.0	0.0	0.7	0.1
02/10	6.0	55.0	3.2	2.4	0.8	1.5	0.5	6.0	55.0	0.0	3.8	-3.8	-0.3	11.5	6.0	55.0	0.0	0.1	-0.1	-1.0	0.0
03/10	15.0	65.0	2.7	2.1	0.7	2.0	0.3	15.0	65.0	0.0	0.0	0.0	.	0.0	15.0	65.0	0.3	0.0	0.2	3.1	0.1
04/10	11.0	45.0	2.8	2.2	0.6	1.5	0.4	11.0	45.0	0.0	0.0	0.0	.	0.0	11.0	45.0	0.0	0.0	0.0	-0.7	0.0
05/10	1.0	30.0	1.0	2.0	-1.0	.	.	1.0	30.0	0.0	0.0	0.0	.	.	.	.	.	.	.	.	.
06/10	5.0	36.0	2.8	2.0	0.8	1.6	0.5	5.0	36.0	11.9	5.8	6.1	0.4	16.2	.	.	.	.	.	.	.
07/10	8.0	43.0	2.1	1.7	0.4	1.2	0.3	8.0	43.0	0.0	0.0	0.0	.	0.0	.	.	.	.	.	.	.
08/10	3.0	46.0	1.0	1.8	-0.8	-1.4	0.5	3.0	46.0	0.0	4.5	-4.5	-0.3	17.9	.	.	.	.	.	.	.
09/10	17.0	57.0	2.1	1.4	0.7	2.5	0.3	17.0	57.0	36.7	3.7	33.1	2.6	12.6	17.0	57.0	0.2	0.0	0.1	2.0	0.1
10/10	5.0	74.0	1.4	1.6	-0.2	-0.4	0.5	5.0	74.0	0.0	8.4	-8.4	-0.5	18.6	5.0	74.0	0.0	0.0	0.0	-0.3	0.0
11/10	8.0	68.0	1.6	1.7	0.0	-0.1	0.4	8.0	68.0	0.0	3.1	-3.1	-0.3	9.0	8.0	68.0	0.1	0.0	0.1	1.8	0.1
12/10	1.0	76.0	2.0	1.1	0.9	.	.	1.0	76.0	0.0	2.7	-2.7	.	.	.	.	.	.	.	.	.
Summ.	**203**	**1480**	**2.7E+0**	**2.4E+0**	**3.0E-1**	**5**		**203**	**1480**	**3.3E+0**	**4.6E+0**	**-1.2E+0**	**1**		**185**	**1249**	**7.4E-2**	**3.7E-2**	**1.1E-2**	**2**	

Note: Mth (month), N (number of observations), μ (mean), t-stat (outcome of t-test for continuous variables based on mean-comparison tests), z-stat (outcome of tests of proportions for indicator variables), SE (standard error), subscript 1 indicates statistic relates to included bonds and subscript 2 indicates statistic relates to excluded bonds

Table 36: Comparison of means and proportions for missing and non-missing non-SG bonds (3 of 3)

	USD-denominated							Non-USD-denominated							Variable interest rate						
Mth	N_1	N_2	μ_1	μ_2	μ_1-μ_2	z-stat	SE	N_1	N_2	μ_1	μ_2	μ_1-μ_2	z-stat	SE	N_1	N_2	μ_1	μ_2	μ_1-μ_2	z-stat	SE
11/08	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
12/08	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
01/09	5.0	56.0	0.2	0.0	0.2	1.6	0.2	5.0	56.0	0.0	0.0	0.0	-0.3	0.0	5.0	56.0	0.6	0.1	0.5	3.6	0.2
02/09	3.0	55.0	0.3	0.1	0.3	1.9	0.3	3.0	55.0	0.0	0.1	-0.1	-0.7	0.0	3.0	55.0	1.0	0.2	0.8	3.2	0.1
03/09	3.0	66.0	0.0	0.2	-0.2	-0.9	0.1	3.0	66.0	0.0	0.1	-0.1	-0.5	0.0	3.0	66.0	0.3	0.4	-0.1	-0.3	0.3
04/09	3.0	99.0	0.3	0.2	0.2	0.7	0.3	3.0	99.0	0.0	0.2	-0.2	-0.9	0.0	3.0	99.0	1.0	0.4	0.6	2.1	0.0
05/09	9.0	55.0	0.0	0.1	-0.1	-0.7	0.0	9.0	55.0	0.1	0.2	-0.1	-0.6	0.1	9.0	55.0	0.1	0.2	-0.1	-0.5	0.1
06/09	8.0	101.0	0.1	0.1	0.0	0.5	0.1	8.0	101.0	0.3	0.1	0.1	1.0	0.2	8.0	101.0	0.5	0.2	0.3	2.3	0.2
07/09	14.0	78.0	0.1	0.1	0.0	0.3	0.1	14.0	78.0	0.1	0.1	0.0	0.3	0.1	14.0	78.0	0.8	0.2	0.6	4.3	0.1
08/09	14.0	45.0	0.1	0.1	0.1	0.6	0.1	14.0	45.0	0.1	0.3	-0.2	-1.5	0.1	14.0	45.0	0.8	0.2	0.6	4.3	0.1
09/09	16.0	59.0	0.3	0.1	0.2	1.8	0.1	16.0	59.0	0.2	0.3	-0.1	-0.8	0.1	16.0	59.0	0.8	0.2	0.5	4.2	0.1
10/09	14.0	78.0	0.4	0.1	0.2	2.3	0.1	14.0	78.0	0.1	0.2	-0.1	-1.3	0.1	14.0	78.0	0.8	0.4	0.4	3.0	0.1
11/09	14.0	73.0	0.3	0.1	0.1	1.4	0.1	14.0	73.0	0.1	0.2	-0.1	-1.2	0.1	14.0	73.0	0.9	0.3	0.6	4.2	0.1
12/09	8.0	64.0	0.0	0.1	-0.1	-0.9	0.0	8.0	64.0	0.0	0.3	-0.3	-1.8	0.1	8.0	64.0	1.0	0.4	0.6	3.3	0.1
01/10	12.0	56.0	0.4	0.1	0.3	2.2	0.1	12.0	56.0	0.1	0.2	-0.1	-1.0	0.1	12.0	56.0	0.6	0.3	0.2	1.6	0.2
02/10	6.0	55.0	0.2	0.1	0.0	0.1	0.2	6.0	55.0	0.2	0.3	-0.1	-0.7	0.2	6.0	55.0	0.8	0.5	0.3	1.6	0.2
03/10	15.0	65.0	0.3	0.0	0.2	3.1	0.1	15.0	65.0	0.1	0.4	-0.3	-2.5	0.1	15.0	65.0	0.8	0.4	0.4	2.8	0.1
04/10	11.0	45.0	0.0	0.1	-0.1	-1.2	0.0	11.0	45.0	0.1	0.2	-0.2	-1.1	0.1	11.0	45.0	0.7	0.3	0.4	2.4	0.2
05/10	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
06/10	5.0	36.0	0.0	0.1	-0.1	-0.9	0.1	5.0	36.0	0.0	0.1	-0.1	-0.5	0.0	5.0	36.0	1.0	0.2	0.8	3.7	0.1
07/10	8.0	43.0	0.0	0.2	-0.2	-1.5	0.1	8.0	43.0	0.3	0.1	0.1	0.8	0.2	8.0	43.0	0.9	0.3	0.6	3.0	0.1
08/10	3.0	46.0	0.0	0.2	-0.2	-1.0	0.1	3.0	46.0	0.3	0.2	0.1	0.6	0.3	3.0	46.0	1.0	0.2	0.8	2.8	0.1
09/10	17.0	57.0	0.1	0.2	-0.1	-1.3	0.1	17.0	57.0	0.1	0.2	-0.1	-1.0	0.1	17.0	57.0	0.5	0.2	0.4	2.9	0.1
10/10	5.0	74.0	0.0	0.3	-0.3	-1.3	0.1	5.0	74.0	0.2	0.1	0.1	0.4	0.2	5.0	74.0	1.0	0.2	0.8	3.7	0.0
11/10	8.0	68.0	0.3	0.3	-0.1	-0.4	0.2	8.0	68.0	0.1	0.1	0.1	0.5	0.1	8.0	68.0	0.8	0.3	0.5	2.9	0.2
12/10	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
Summ.	**201**	**1374**	**1.6E-1**	**1.3E-1**	**1.4E-2**	**3**		**201**	**1374**	**1.1E-1**	**1.8E-1**	**-7.7E-2**	**0**		**201**	**1374**	**7.6E-1**	**2.8E-1**	**4.8E-1**	**18**	**201**

Note: Mth (month), N (number of observations), μ (mean), t-stat (outcome of t-test for continuous variables based on mean-comparison tests), z-stat (outcome of tests of proportions for indicator variables), SE (standard error), subscript 1 indicates statistic relates to included bonds and subscript 2 indicates statistic relates to excluded bonds

A3.2 Economic significance of differences between included and excluded bonds

The characteristics of included and excluded bonds were observed to be largely similar. However, differences between included and excluded bonds were also observed, particularly, issuance volumes of included non-SG bonds were larger than issuance volumes of excluded non-SG bonds.

This finding could be of importance to the analysis relating to issuing cost conducted. For instance, smaller bonds may be less likely to be state guaranteed and also face higher issuing cost. If this is the case, then the impact of state guarantees on issuing cost is likely to be overestimated.

To analyse the economic significance of differences in issuance volume of non-SG bonds included and excluded in analyses relating to issuing cost, two checks were conducted.

A3.2.1 Re-estimation based on issuance volume

Firstly, the main empirical specification for the impact of state guarantees on issuing cost was re-estimated for samples of smaller and large issuance volume.

By considering small issuance volumes only, we attempt to correct for the possibility that previously included non-SG bonds are unusually large.

Bonds were split on the basis of issuance volume. If a bond issue was larger than the median it was included in the large issues sample and if it was smaller than the median it was included in the small issues sample.

The re-estimation results are presented in Table 37. As per the models presented in Section 3, the impact of state guarantees on issuing cost is in the expected direction, in the region of the same magnitude and highly statistically significant whether the model is estimated on small issues or large issues only.

Table 37: Re-estimation of issuing cost model, by issuance volume		
	Sample	
Variable	**Small issues**	**Large issues**
Use of state guarantee ($GUARANTEE_i$)	**-32.5*** (12.3)**	**-36.6*** (7.62)**
Bond rating ($RATING_i$)	-15.2 (15.6)	-35.2*** (6.46)
Time to maturity at issue ($MATURITY_{it}$)	-15.0*** (4.50)	5.22** (2.46)
Sovereign CDS (SOV_i)	0.424*** (0.048)	0.165*** (0.0259)
Issuance volume ($LIQUID_i$)	5.53e-7** (2.7e-7)	-6.27e-9 (4.00e-9)
Private placement ($PRIVATE_i$)	18.1 (16.1)	1.13 (9.21)
Volatility (VOL_{it})	3.25 (2.34)	0.449 (1.21)
USD-denominated ($CURRENCY\text{-}USD_i$)	-7.86 (12.1)	-5.68 (6.55)
Non-EUR- and non-USD-denominated ($CURRENCY\text{-}OTHER_i$)	-19.0 (12.1)	2.96 (7.40)
Variable interest rate ($COUPON\text{-}VARIABLE_i$)	17.2 (45.3)	-15.6** (7.20)
Additional controls (not displayed)		
Month of issue dummies (T_i)	Y	Y
Country of risk ($COUNTRY_i$)	N	N
Number of observations	*204*	*479*
Adjusted-R^2	*0.41*	*0.38*

A3.2.2 Analysis of issuing bank size

Secondly, the issuance volume of included and excluded (SG and) non-SG bonds was considered by bank size.

The motivation for this analysis was to determine whether missing issuing cost data was particularly prevalent among smaller banks (perhaps due to lower reporting requirements). If found, this would be a cause for concern because smaller banks may also be more subject to credit risk (and higher issuing cost) and less likely to access state guarantees.

However, a comparison of means shows that smaller, more risky banks were no more or less likely to have their bonds included in or excluded from the analysis due to issuance volume. The results of this test are shown in Table 38. Although the mean issuance volume is smaller for smaller than larger banks (as one may expect), the difference is not statistically significant.

Table 38: Differences in issuance volume between large and small banks

	N_1	N_2	μ_1	μ_2	μ_1-μ_2	t-stat	SE
Excluded bonds	27	95	2316	2425	-109	-0.379	288
Included bonds	41	41	3195	3204	-8.98	-0.28	32.5

Note: Mth (month), N (number of observations), μ (mean), t-stat (outcome of t-test for continuous variables based on mean-comparison tests), SE (standard error), subscript 1 indicates statistic relates to smaller-more risky banks and subscript 2 indicates statistic relates to larger-less risky banks

A3.2.3 Imputing missing issuing cost data

Finally, Table 39 presents the results of re-estimating the main issuing cost model with imputed data.

Missing issuing cost data was replaced with imputed issuing cost data. This was achieved through a stochastic process of matching bonds for which issuing cost data was missing with bonds for which issuing cost data was present on the basis of observable bond characteristics, which was repeated multiple times to test for the sensitivity of the matching process. Formally, OLS regression was used to impute the data and 10 iterations were undertaken.

Table 39 presents the results of averaging over the multiple imputations and shows that the main effect of state guarantees on issuing costs is robust to the use of imputed data.

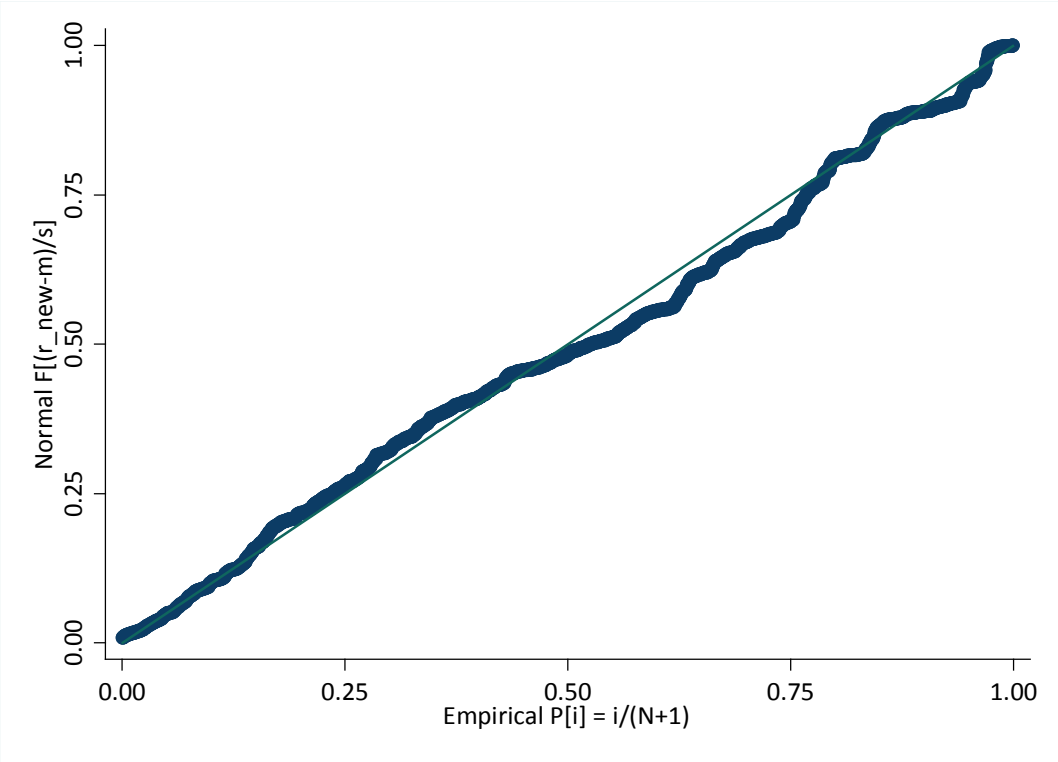
Table 39: Re-estimation of issuing cost model with imputed data	
Variable	
Use of state guarantee ($GUARANTEE_i$)	**-15.7*** (3.27)**
Bond rating ($RATING_i$)	-95.5*** (4.04)
Time to maturity at issue ($MATURITY_{it}$)	-7.56*** (1.04)
Sovereign CDS (SOV_i)	0.250*** (0.0118)
Issuance volume ($LIQUID_i$)	9.14e-8*** (2.57e-9)
Private placement ($PRIVATE_i$)	-28.1*** (4.22)
Volatility (VOL_{it})	1.61 (1.22)
USD-denominated ($CURRENCY\text{-}USD_i$)	-69.7*** (3.35)
Non-EUR- and non-USD-denominated ($CURRENCY\text{-}OTHER_i$)	-92.2*** (2.89)
Variable interest rate ($COUPON\text{-}VARIABLE_i$)	177*** (2.48)
Additional controls (not displayed)	
Month of issue dummies (T_i)	Y
Country of risk ($COUNTRY_i$)	N
Number of observations	*2431*
Adjusted-R^2	*0.75*

Annex 4 Results of diagnostic tests of issuing cost model

A4.1 Normality of residuals

The residuals were found to be approximately normal. There was little evidence of deviation from normality on the basis of inspection of the standardised normal probability plot.

Figure 22: Standardised normal probability plot of residuals of main issuing cost model



A4.2 Multi-collinearity

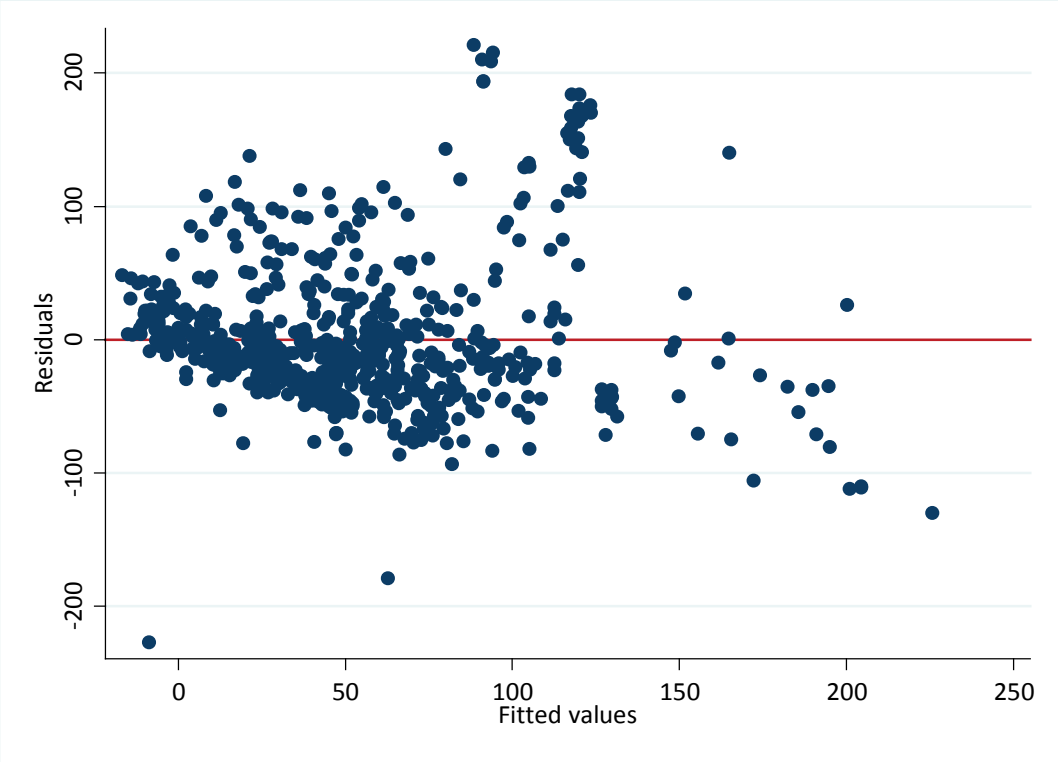
The hypothesis that the estimated coefficients were stable and standard errors were not inflated is supported by variance inflation factors, which were mostly within the standard band of tolerance (i.e. greater than 0.1), suggesting that the estimation results are robust to multicollinearity.

Table 40: Results of test of multi-collinearity of main issuing cost model	
Variable	**1/VIF**
Use of state guarantee (*GUARANTEE*$_i$)	0.55
Bond rating (*RATING*$_i$)	0.56
Time to maturity at issue (*MATURITY*$_{it}$)	0.87
Sovereign CDS (*SOV*$_i$)	0.73
Issuance volume (*LIQUID*$_i$)	0.44
Private placement (*PRIVATE*$_i$)	0.82
Volatility (*VOL*$_{it}$)	0.10
USD-denominated (*CURRENCY-USD*$_i$)	0.69
Non-EUR- and non-USD-denominated (*CURRENCY-OTHER*$_i$)	0.70
Variable interest rate (*COUPON-VARIABLE*$_i$)	0.45
Additional controls (not displayed)	
Month of issue dummies (T_i)	Y
Country of risk (*COUNTRY*$_i$)	N
Number of observations	*683*

A4.3 Homoscedasticity of residuals

The variance of the residuals of the main empirical specification was not clearly found to be homoscedastic through a graph of residuals versus fitted (predicted) values. However, re-estimation of the main empirical specification using quantile regression using heteroscedastic robust standard errors (presented in Section 3.5.4) revealed that the main result holds despite the above.

Figure 23: Analysis of variance of residuals of main issuing cost model



Additionally, the main empirical specification was re-estimated using generalised least squares and the estimation results, which accounts for potential heteroscedasticity of residuals, are reported below.

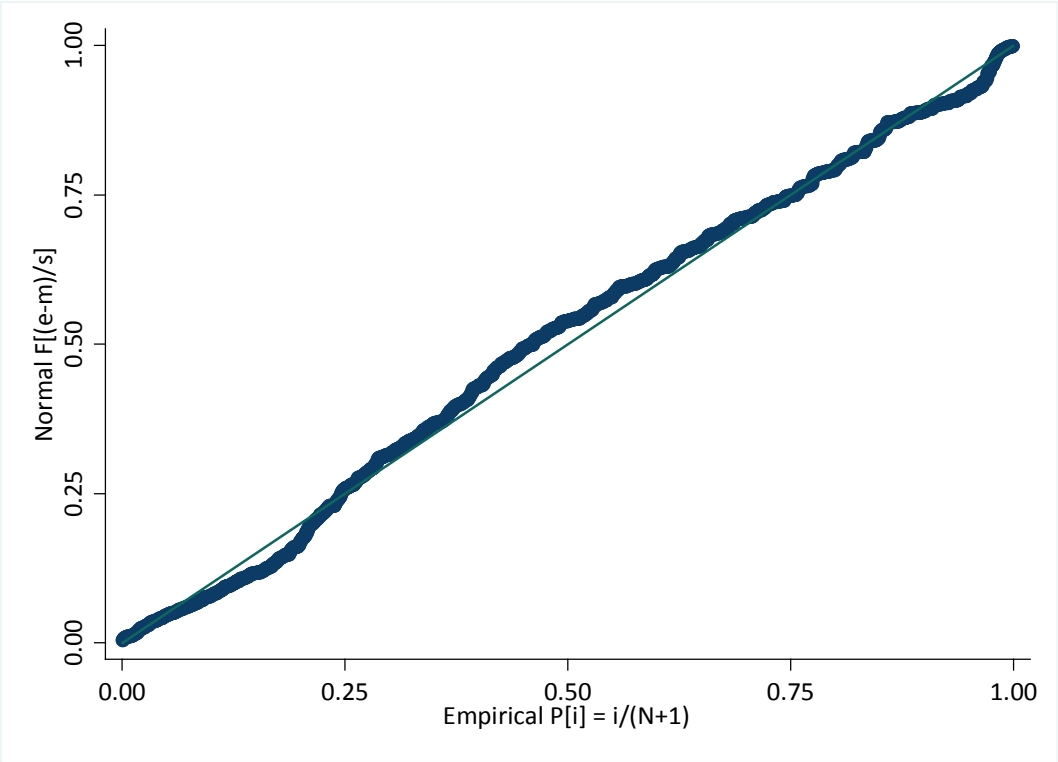
Table 41: Re-estimation results of issuing cost model using generalised least squares	
Variable	
Use of state guarantee ($GUARANTEE_i$)	**-33.4*** (6.20)**
Bond rating ($RATING_i$)	-31.3*** (5.80)
Time to maturity at issue ($MATURITY_{it}$)	-0.321 (2.16)
Sovereign CDS (SOV_i)	0.223*** (0.0222)
Issuance volume ($LIQUID_i$)	-6.07e-9 (4.02e-9)
Private placement ($PRIVATE_i$)	2.66 (8.06)
Volatility (VOL_{it})	4.01 (2.85)
USD-denominated ($CURRENCY\text{-}USD_i$)	-6.73 (5.79)
Non-EUR- and non-USD-denominated ($CURRENCY\text{-}OTHER_i$)	-7.63 (6.06)
Variable interest rate ($COUPON\text{-}VARIABLE_i$)	14.0* (7.11)
Additional controls (not displayed)	
Month of issue dummies (T_i)	Y
Country of risk ($COUNTRY_i$)	N
Number of observations	*683*
Adjusted-R^2	*0.33*

Annex 5 Results of diagnostic tests of spill-over model

A5.1 Normality of residuals

The residuals were found to be approximately normal. There was little evidence of deviation from normality on the basis of inspection of the standardised normal probability plot.

Figure 24: Standardised normal probability plot of residuals of main spill-over model



A5.2 Multi-collinearity

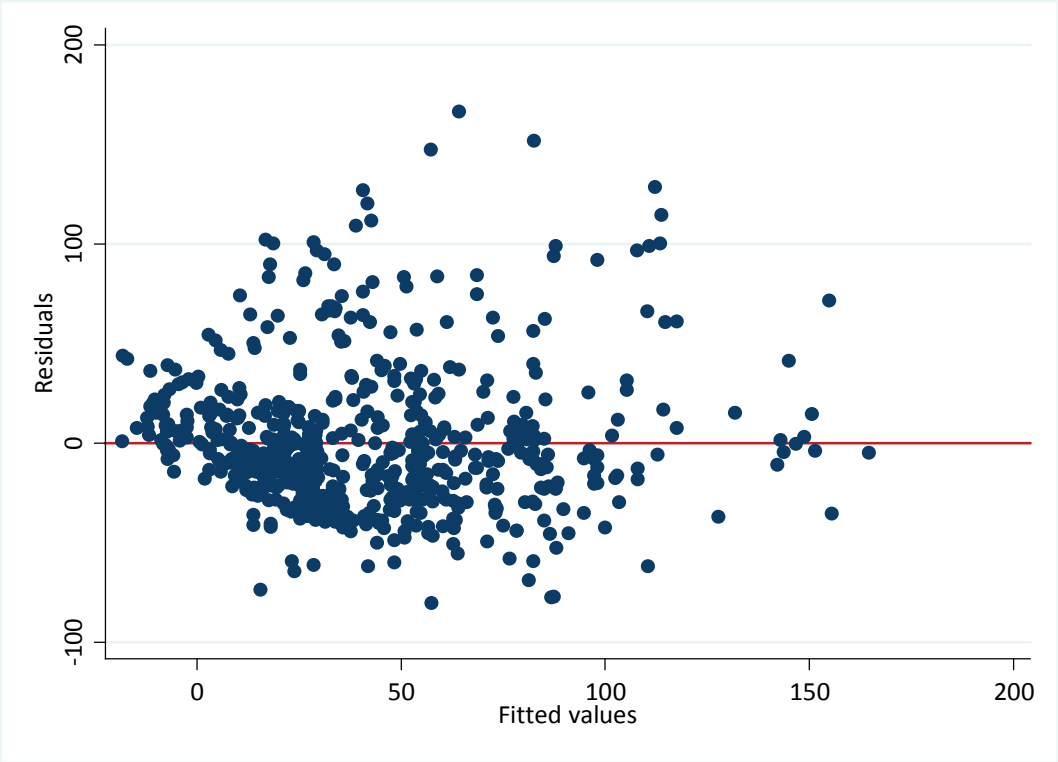
The hypothesis that the estimated coefficients were stable and standard errors were not inflated is supported by variance inflation factors, which were mostly within the standard band of tolerance (i.e. greater than 0.1), suggesting that the estimation results are robust to multicollinearity.

Table 42: Results of test of multi-collinearity of main spill-over model	
Variable	**1/VIF**
Aggregate volume of SG bond issues *(SG ISSUING INTENSITY$_{im}$)*	0.104
Aggregate volume of non-SG bond issues *(NON-SG ISSUING INTENSITY$_{im}$)*	0.111
Use of state guarantee (*GUARANTEE$_i$*)	0.542
Bond rating (*RATING$_i$*)	0.561
Time to maturity at issue (*MATURITY$_{it}$*)	0.870
Sovereign CDS (*SOV$_i$*)	0.765
Issuance volume (*LIQUID$_i$*)	0.458
Private placement (*PRIVATE$_i$*)	0.813
Volatility (*VOL$_{it}$*)	0.0311
USD-denominated (*CURRENCY-USD$_i$*)	0.685
Non-EUR- and non-USD-denominated (*CURRENCY-OTHER$_i$*)	0.684
Variable interest rate (*COUPON-VARIABLE$_i$*)	0.466
Additional controls (not displayed)	
Month of issue dummies (*T$_i$*)	Y
Country of risk (*COUNTRY$_i$*)	N
Number of observations	*647*

A5.3 Homoscedasticity of residuals

The variance of the residuals of the main empirical specification was not clearly found to be homoscedastic.

Figure 25: Analysis of variance of residuals of main issuing cost model



In light of this, the main spill-over model was re-estimated using generalised least squares, as per Section A4.3.

Table 43: Re-estimation results of issuing cost model using generalised least squares	
Variable	
Aggregate volume of SG bond issues *(SG ISSUING INTENSITY$_{im}$)*	**0.0400***** **(0.0108)**
Aggregate volume of non-SG bond issues *(NON-SG ISSUING INTENSITY$_{im}$)*	0.0405 (0.0342)
Use of state guarantee (*GUARANTEE$_i$*)	-51.2*** (5.20)
Bond rating (*RATING$_i$*)	-2.06 (4.56)
Time to maturity at issue (*MATURITY$_{it}$*)	2.23 (1.43)
Sovereign CDS (*SOV$_i$*)	0.0600 (0.0440)
Issuance volume (*LIQUID$_i$*)	-9.70e-9*** (2.63e-9)
Private placement (*PRIVATE$_i$*)	-1.66 (5.30)
Volatility (*VOL$_{it}$*)	0.651** (0.291)
USD-denominated (*CURRENCY-USD$_i$*)	3.95 (3.99)
Non-EUR- and non-USD-denominated (*CURRENCY-OTHER$_i$*)	7.08 (4.54)
Variable interest rate (*COUPON-VARIABLE$_i$*)	-26.7*** (4.98)
Additional controls (not displayed)	
Month of issue dummies (T_i)	N
Country of risk (*COUNTRY$_i$*)	Y
Number of observations	*647*

Annex 6 Availability of bank data

The tables below show the number and shares of non-missing observations in each quarter for bank data. As the tables show, several quarters are very poorly represented, which necessitated the analysis of annual data.

Table 44: Non-missing values by quarter, equity and total liabilities and equity

	Equity		Total Liabilities and Equity	
y2005q1	6	2.82%	6	2.82%
y2005q2	51	23.94%	51	23.94%
y2005q3	11	5.16%	11	5.16%
y2005q4	0	0.00%	0	0.00%
y2006q1	12	5.63%	12	5.63%
y2006q2	71	33.33%	71	33.33%
y2006q3	23	10.80%	23	10.80%
y2006q4	0	0.00%	0	0.00%
y2007q1	19	8.92%	19	8.92%
y2007q2	87	40.85%	87	40.85%
y2007q3	23	10.80%	23	10.80%
y2007q4	1	0.47%	1	0.47%
y2008q1	30	14.08%	30	14.08%
y2008q2	124	58.22%	124	58.22%
y2008q3	29	13.62%	29	13.62%
y2008q4	1	0.47%	1	0.47%
y2009q1	47	22.07%	47	22.07%
y2009q2	123	57.75%	123	57.75%
y2009q3	52	24.41%	53	24.88%
y2009q4	1	0.47%	1	0.47%
y2010q1	58	27.23%	58	27.23%
y2010q2	132	61.97%	132	61.97%
y2010q3	52	24.41%	52	24.41%
y2010q4	1	0.47%	1	0.47%
y2011q1	58	27.23%	58	27.23%
y2011q2	132	61.97%	132	61.97%

Source: Bankscope

Table 45: Non-missing values by quarter, operating income, net interest income and other earning assets

	Operating Income (Memo)		Net Interest Income		Other Earning Assets	
y2005q1	6	2.82%	6	2.82%	6	2.82%
y2005q2	50	23.47%	50	23.47%	50	23.47%
y2005q3	11	5.16%	11	5.16%	11	5.16%
y2005q4	0	0.00%	0	0.00%	0	0.00%
y2006q1	12	5.63%	12	5.63%	12	5.63%
y2006q2	71	33.33%	71	33.33%	71	33.33%
y2006q3	23	10.80%	23	10.80%	23	10.80%
y2006q4	0	0.00%	0	0.00%	0	0.00%
y2007q1	19	8.92%	19	8.92%	19	8.92%
y2007q2	95	44.60%	95	44.60%	87	40.85%
y2007q3	23	10.80%	23	10.80%	23	10.80%
y2007q4	1	0.47%	1	0.47%	1	0.47%
y2008q1	31	14.55%	31	14.55%	30	14.08%
y2008q2	125	58.69%	125	58.69%	124	58.22%
y2008q3	29	13.62%	29	13.62%	29	13.62%
y2008q4	1	0.47%	1	0.47%	1	0.47%
y2009q1	49	23.00%	49	23.00%	47	22.07%
y2009q2	123	57.75%	123	57.75%	123	57.75%
y2009q3	52	24.41%	52	24.41%	52	24.41%
y2009q4	1	0.47%	1	0.47%	1	0.47%
y2010q1	58	27.23%	58	27.23%	58	27.23%
y2010q2	132	61.97%	132	61.97%	132	61.97%
y2010q3	52	24.41%	52	24.41%	52	24.41%
y2010q4	1	0.47%	1	0.47%	1	0.47%
y2011q1	58	27.23%	58	27.23%	58	27.23%
y2011q2	132	61.97%	132	61.97%	132	61.97%

Source: Bankscope

Table 46: Non-missing values by quarter, deposits, funding and pref. shares and hybrid capital accounted for as debt

	Total Customer Deposits		Deposits from Banks		Other Deposits and Short-term Borrowings		Total Long Term Funding		Total Deposits and Short-term Funding		Pref. Shares and Hybrid Capital accounted for as Debt	
y2005q1	6	2.82%	6	2.82%	1	0.47%	6	2.82%	6	2.82%	1	0.47%
y2005q2	50	23.47%	48	22.54%	8	3.76%	47	22.07%	51	23.94%	13	6.10%
y2005q3	11	5.16%	10	4.69%	2	0.94%	11	5.16%	11	5.16%	2	0.94%
y2005q4	0	0.00%	0	0.00%	0	0.00%	0	0.00%	0	0.00%	0	0.00%
y2006q1	12	5.63%	12	5.63%	2	0.94%	12	5.63%	12	5.63%	6	2.82%
y2006q2	67	31.46%	65	30.52%	20	9.39%	66	30.99%	71	33.33%	16	7.51%
y2006q3	23	10.80%	23	10.80%	5	2.35%	23	10.80%	23	10.80%	10	4.69%
y2006q4	0	0.00%	0	0.00%	0	0.00%	0	0.00%	0	0.00%	0	0.00%
y2007q1	18	8.45%	19	8.92%	5	2.35%	19	8.92%	19	8.92%	8	3.76%
y2007q2	86	40.38%	85	39.91%	23	10.80%	83	38.97%	87	40.85%	18	8.45%
y2007q3	21	9.86%	22	10.33%	8	3.76%	23	10.80%	23	10.80%	10	4.69%
y2007q4	1	0.47%	0	0.00%	1	0.47%	1	0.47%	1	0.47%	0	0.00%
y2008q1	29	13.62%	29	13.62%	13	6.10%	30	14.08%	30	14.08%	13	6.10%
y2008q2	121	56.81%	122	57.28%	39	18.31%	121	56.81%	124	58.22%	45	21.13%
y2008q3	28	13.15%	28	13.15%	14	6.57%	29	13.62%	29	13.62%	13	6.10%
y2008q4	1	0.47%	0	0.00%	1	0.47%	1	0.47%	1	0.47%	0	0.00%
y2009q1	45	21.13%	45	21.13%	14	6.57%	45	21.13%	46	21.60%	20	9.39%
y2009q2	120	56.34%	119	55.87%	39	18.31%	121	56.81%	123	57.75%	47	22.07%
y2009q3	52	24.41%	50	23.47%	15	7.04%	51	23.94%	53	24.88%	20	9.39%
y2009q4	1	0.47%	0	0.00%	1	0.47%	1	0.47%	1	0.47%	1	0.47%
y2010q1	56	26.29%	55	25.82%	21	9.86%	56	26.29%	57	26.76%	27	12.68%
y2010q2	128	60.09%	127	59.62%	43	20.19%	130	61.03%	132	61.50%	58	27.23%
y2010q3	52	24.41%	51	23.94%	19	8.92%	52	24.41%	52	24.41%	24	11.27%

Table 46: Non-missing values by quarter, deposits, funding and pref. shares and hybrid capital accounted for as debt

	Total Customer Deposits		Deposits from Banks		Other Deposits and Short-term Borrowings		Total Long Term Funding		Total Deposits and Short-term Funding		Pref. Shares and Hybrid Capital accounted for as Debt	
y2010q4	1	0.47%	0	0.00%	1	0.47%	1	0.47%	1	0.47%	1	0.47%
y2011q1	56	26.29%	55	25.82%	21	9.86%	56	26.29%	57	26.76%	27	12.68%
y2011q2	128	60.09%	127	59.62%	43	20.19%	130	61.03%	131	61.50%	58	27.23%

Source: Bankscope

Table 47: Non-missing values by quarter, loan variables

	Net Loans		Residential Mortgage Loans		Other Mortgage Loans		Other Consumer/ Retail Loans		Corporate & Commercial Loans		Other Loans		Less: Reserves for Impaired Loans/ NPLs	
y2005q1	6	2.82%	1	0.47%	0	0.00%	1	0.47%	1	0.47%	5	2.35%	3	1.41%
y2005q2	51	23.94%	4	1.88%	0	0.00%	5	2.35%	18	8.45%	38	17.84%	18	8.45%
y2005q3	11	5.16%	1	0.47%	0	0.00%	2	0.94%	1	0.47%	11	5.16%	4	1.88%
y2005q4	0	0.00%	0	0.00%	0	0.00%	0	0.00%	0	0.00%	0	0.00%	0	0.00%
y2006q1	12	5.63%	4	1.88%	0	0.00%	3	1.41%	2	0.94%	12	5.63%	9	4.23%
y2006q2	71	33.33%	12	5.63%	0	0.00%	13	6.10%	24	11.27%	60	28.17%	37	17.37%
y2006q3	23	10.80%	4	1.88%	0	0.00%	7	3.29%	9	4.23%	23	10.80%	14	6.57%
y2006q4	0	0.00%	0	0.00%	0	0.00%	0	0.00%	0	0.00%	0	0.00%	0	0.00%
y2007q1	19	8.92%	5	2.35%	0	0.00%	3	1.41%	4	1.88%	19	8.92%	15	7.04%
y2007q2	87	40.85%	12	5.63%	0	0.00%	11	5.16%	26	12.21%	70	32.86%	49	23.00%
y2007q3	23	10.80%	6	2.82%	0	0.00%	6	2.82%	5	2.35%	23	10.80%	17	7.98%
y2007q4	1	0.47%	1	0.47%	0	0.00%	1	0.47%	1	0.47%	1	0.47%	1	0.47%
y2008q1	30	14.08%	7	3.29%	0	0.00%	7	3.29%	7	3.29%	30	14.08%	26	12.21%
y2008q2	124	58.22%	20	9.39%	1	0.47%	20	9.39%	42	19.72%	101	47.42%	71	33.33%
y2008q3	29	13.62%	8	3.76%	0	0.00%	8	3.76%	7	3.29%	29	13.62%	22	10.33%
y2008q4	1	0.47%	1	0.47%	0	0.00%	1	0.47%	1	0.47%	1	0.47%	1	0.47%
y2009q1	47	22.07%	11	5.16%	0	0.00%	12	5.63%	21	9.86%	36	16.90%	36	16.90%
y2009q2	123	57.75%	27	12.68%	2	0.94%	23	10.80%	53	24.88%	88	41.31%	91	42.72%
y2009q3	53	24.88%	9	4.23%	0	0.00%	11	5.16%	23	10.80%	39	18.31%	43	20.19%
y2009q4	1	0.47%	0	0.00%	0	0.00%	1	0.47%	1	0.47%	1	0.47%	1	0.47%
y2010q1	58	27.23%	11	5.16%	1	0.47%	12	5.63%	20	9.39%	45	21.13%	48	22.54%
y2010q2	132	61.97%	28	13.15%	3	1.41%	25	11.74%	51	23.94%	103	48.36%	104	48.83%
y2010q3	52	24.41%	9	4.23%	0	0.00%	12	5.63%	23	10.80%	39	18.31%	44	20.66%

Table 47: Non-missing values by quarter, loan variables

	Net Loans		Residential Mortgage Loans		Other Mortgage Loans		Other Consumer/ Retail Loans		Corporate & Commercial Loans		Other Loans		Less: Reserves for Impaired Loans/ NPLs	
y2010q4	1	0.47%	0	0.00%	0	0.00%	1	0.47%	1	0.47%	1	0.47%	1	0.47%
y2011q1	58	27.23%	11	5.16%	1	0.47%	12	5.63%	20	9.39%	45	21.13%	48	22.54%
y2011q2	132	61.97%	28	13.15%	3	1.41%	25	11.74%	51	23.94%	103	48.36%	104	48.83%

Source: Bankscope

The table below show the number of non-missing values for annual data.

Table 48: Non-missing values by year, equity and total liabilities and equity

	Equity		Total Liabilities and Equity	
Y2005	176	82.63%	176	82.63%
Y2006	191	89.67%	191	89.67%
Y2007	193	90.61%	193	90.61%
Y2008	202	94.84%	202	94.84%
Y2009	207	97.18%	207	97.18%
Y2010	160	75.12%	160	75.12%

Source: Bankscope

Table 49: Non-missing values by year, operating income, net interest income and other earning assets

	Operating Income (Memo)		Net Interest Income		Other Earning Assets	
Y2005	172	80.75%	171	80.28%	175	82.16%
Y2006	188	88.26%	187	87.79%	190	89.20%
Y2007	190	89.20%	190	89.20%	192	90.14%
Y2008	200	93.90%	199	93.43%	202	94.84%
Y2009	204	95.77%	203	95.31%	207	97.18%
Y2010	158	74.18%	157	73.71%	160	75.12%

Source: Bankscope

Table 50: Non-missing values by year, deposits, funding and pref. shares and hybrid capital accounted for as debt

	Total Customer Deposits		Deposits from Banks		Other Deposits and Short-term Borrowings		Total Long Term Funding		Total Deposits and Short-term Funding		Pref. Shares and Hybrid Capital accounted for as Debt	
Y2005	170	79.81%	168	78.87%	73	34.27%	169	79.34%	173	81.22%	80	37.56%
Y2006	183	85.92%	184	86.38%	82	38.50%	186	87.32%	188	88.26%	94	44.13%
Y2007	186	87.32%	188	88.26%	88	41.31%	191	89.67%	190	89.20%	101	47.42%
Y2008	196	92.02%	198	92.96%	98	46.01%	196	92.02%	200	93.90%	106	49.77%
Y2009	200	93.90%	202	94.84%	102	47.89%	205	96.24%	204	95.77%	114	53.52%
Y2010	156	73.24%	159	74.65%	76	34.74%	160	75.12%	160	75.12%	86	40.38%

Source:Bankscope

Table 51: Non-missing values by year, loan variables

	Net Loans		Residential Mortgage Loans		Other Mortgage Loans		Other Consumer/ Retail Loans		Corporate & Commercial Loans		Other Loans		Less: Reserves for Impaired Loans/ NPLs	
Y2005	172	80.75%	41	19.25%	0	0.00%	52	24.41%	84	39.44%	139	65.26%	112	52.58%
Y2006	187	87.79%	38	17.84%	0	0.00%	53	24.88%	86	40.38%	154	72.30%	130	61.03%
Y2007	190	89.20%	42	19.72%	1	0.47%	43	20.19%	82	38.50%	156	73.24%	138	64.79%
Y2008	200	93.90%	48	22.54%	5	2.35%	46	21.60%	81	38.03%	170	79.81%	171	80.28%
Y2009	204	95.77%	51	23.94%	8	3.76%	43	20.19%	79	37.09%	170	79.81%	178	83.57%
Y2010	160	75.12%	45	21.13%	9	4.23%	38	17.84%	69	32.39%	130	61.03%	140	65.73%

Source:Bankscope

Annex 7 Linking Bloomberg and Bankscope data

Information on parameters which relate to bank performance was downloaded from the BankScope.

BankScope and Bloomberg do not share a common bank identifier. In light of this, the discussion below describes the process followed to link the two databases.

Bloomberg identifies the issuer of a bond through two different fields:

- Eqyid
- Shortname

Eqyid refers to the issuer's parent equity, and so relates to a higher organisational level than what may be an issuing subsidiary. Shortname is a 16-digit abbreviation of the bank's name.

Shortname was chosen as the appropriate link between the two databases on several grounds.

- There are 470 unique shortnames in the bond issuance dataset as opposed to only 334 eqyids, which shows that shortname is the least aggregated of the two identifiers (some shortnames necessarily refer back to the same eqyid);
- 189 eqyids are numbers which do not offer any information and would lead to poor matching with the BankScope database and consequently attrition of the dataset.

As there are no common identifiers, linking the Bloomberg and BankScope databases was based on the bank names. Shortname from the Bloomberg database was the input in the BankScope search engine and the results were investigated manually. In the case of several results for the same bank appearing, the result in which the latest data was made available was chosen. In case several bank names appear in the list of results, a bank was chosen if other information from Bloomberg identified it convincingly. Information such as country or eqyid were helpful in combination with information from company websites, etc.

213 banks that issued bonds eligible for state guarantees were matched with banks in BankScope. A further 43 banks were matched, but the bonds issued by those institution were not eligible for state guarantee. Six institutions were not matched.

Database considerations

The BankScope database was chosen for the bank-specific data because it offers information at a level which is lower in the group hierarchy, than the Bloomberg database whose issuer identifier may be related to the parent of the actual issuer.

Some of the BankScope variables are, however, incompletely populated. To address this problem, Bloomberg information for comparable variables was downloaded at the potentially more aggregated eqyid-level. Unfortunately the Bloomberg variables are even less populated and therefore the BankScope information is kept for the analysis.

Table 39 provides a comparison of the number of non-missing values in selected variables from BankScope (BS) and Bloomberg (BB). The BankScope variable is written above the corresponding Bloomberg variable(s). In case there is more than one Bloomberg variable, the BankScope variable is a sum of the Bloomberg variables. For the variables in the group marked with an asterisk (*), the Bloomberg variables do not sum to the BankScope variable. The reason is that BankScope utilise the Universal Bank Model, which is a consolidated approach to reading raw data as they are found on the balance sheet. Bloomberg do not utilise the same model, and therefore the numbers are dissimilar.

The conclusion from Table 52 is that the number of missing values on Bloomberg is consistently larger than the BankScope equivalent, and so Bloomberg do not offer any additional information.

Table 52: Comparison of non-missings in BankScope and Bloomberg, number of non-missing values

Variable	2005	2006	2007	2008	2009	2010
Equity (BS)	168	184	186	197	201	160
ARD Total Shareholder's Equity (BB)	58	75	88	102	106	70
Total Deposits & Short-term Funding (BS)	165	181	183	195	198	160
BS Customer Deposits (BB)	104	125	149	167	170	118
BS ST Borrow (BB)	103	124	149	169	170	118
BS Ser Sold Repo Agrmnt (BB)	44	49	59	67	85	61
Total Customer Deposits (BS)	162	177	180	192	195	157
BS Customer Deposits (BB)	104	125	149	167	170	118
Total Long-term Funding (BS)*	161	180	185	191	199	160
BS LT Borrow (BB)*	104	125	147	165	171	117
BS other LT Liabilities (BB)*	102	121	145	162	163	116
Total Liabilities & Equity (BS)	168	184	186	197	201	160
Tot Liab and Eqy (BB)	106	127	155	173	174	120
Net Interest Income (BS)	164	181	184	195	198	158
Net Int Inc (BB)	102	125	150	169	171	118
Net Loans (BS)	164	180	183	195	198	160
BS Loan Mtg (BB)	104	124	146	164	171	118
Deposits from Banks (BS)	162	179	182	194	197	160
BS Total Bank Deposits (BB)	28	26	32	38	52	89
Less Res for Impaired Loans/npls (BS)	110	130	137	166	171	138
BS Rsrv Loan Loss (BB)	55	75	87	99	111	76

Note: *: The Bloomberg variables do not fully correspond to the BankScope variable as the BankScope variable is generated by BankScope's Universal Bank Model which is a consolidated model for aligning raw data.

Annex 8 Investigation of estimation issues for models of bank outcomes

A8.1 Endogeneity of state guarantees

Participation in a state guarantee scheme is relatively uncorrelated with previous bank outcomes, as suggested by below. This is supportive of the view that state guarantee schemes are exogenous to the circumstances of any particular bank.

Table 53: Correlation between participation in SG scheme and credit extension

	Participated	Net loans (t-1)	Net loans (t-2)	Net loans (t-3)	Net loans (t-4)
Participated	1.0000				
Net loans (t-1)	0.0740	1.0000			
Net loans (t-2)	0.0807	0.9668	1.0000		
Net loans (t-3)	0.0700	0.9360	0.9545	1.0000	
Net loans (t-4)	-0.0277	0.9840	0.9555	0.9804	1.0000

Note: Credit extension is measured by net loans

Table 54: Correlation between participation in SG scheme and funding outcomes

	Participated	Funding (t-1)	Funding (t-2)	Funding (t-3)	Funding (t-4)
Participated	1.0000				
Funding (t-1)	0.0523	1.0000			
Funding (t-2)	0.0577	0.9668	1.0000		
Funding (t-3)	0.0500	0.9283	0.9682	1.0000	
Funding (t-4)	-0.0294	0.9613	0.9582	0.9761	1.0000

Note: Funding outcomes are measured by total liabilities and equity

A8.2 Autocorrelation of bank outcomes

Bank outcomes display high levels of year-on-year autocorrelation. This requires the use of an estimator that provides heteroscedasticity consistent standard errors.

Table 55: Autocorrelation of credit extension

	Credit extension (t)	Credit extension (t-1)	Credit extension (t-2)	Credit extension (t-3)	Credit extension (t-4)
Credit extension (t)	1.0000				
Credit extension (t-1)	0.97	1.0000			
Credit extension (t-2)	0.9447	0.9668	1.0000		
Credit extension (t-3)	0.9412	0.936	0.9545	1.0000	
Credit extension (t-4)	0.9669	0.984	0.9555	0.9804	1.0000

Note: Credit extension is measured by net loans

Table 56: Autocorrelation of funding outcomes

	Funding (t)	Funding (t-1)	Funding (t-2)	Funding (t-3)	Funding (t-4)
Funding (t)	1.0000				
Funding (t-1)	0.9712	1.0000			
Funding (t-2)	0.9380	0.9668	1.0000		
Funding (t-3)	0.9421	0.9283	0.9682	1.0000	
Funding (t-4)	0.9781	0.9613	0.9582	0.9761	1.0000

Note: Funding outcomes are measured by the sum of total liabilities and equity