DISCUSSION PAPER SERIES

DP13709

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FINANCIAL ECONOMICS AND INTERNATIONAL MACROECONOMICS AND FINANCE

ISSN 0265-8003

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Discussion Paper DP13709
Published 01 May 2019
Submitted 27 April 2019

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Abstract

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JEL Classification: G23

Keywords: banks, sovereign risk, Risk premium, government guarantee

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Acknowledgements
We are grateful to Piergiorgio Alessandri, Antje Berndt, Nick Bloom, Lorenzo Braccini, Markus Brunnermeier, Darrell Duffie, Carlo Favero, Sydney Ludvigson, Matteo Maggiori, Guillaume Roussellet, Pietro Veronesi, Gianluca Violante, Tanju Yorulmazer and seminar participants at Banca d'Italia, Bank of England, Einaudi Institute for Economics and Finance (EIEF), the Banco Central do Brasil (XII Annual Seminar on Risk, Financial Stability, and Banking) and the Universita' Cattolica del Sacro Cuore (5th Workshop in Macro Banking and Finance) for helpful suggestions and conversations. This research was partly carried out when Gabriele Zinna was Visiting Scholar at EIEF. All errors are our responsibility. The views expressed in this paper are those of the authors and do not necessarily reflect those of the Bank of Italy.

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Applying standard portfolio-sort techniques to bank asset returns for 15 countries from 2004 to 2018, we uncover a risk premium associated with implicit government guarantees. This risk premium is intimately tied to sovereign risk, suggesting that guaranteed banks, defined as those of particular importance to the national economy, inherit the risk of the guarantor. Indeed, this premium does not exist in safe-haven countries. We rationalize these findings with a model in which implicit government guarantees are risky in the sense that they provide protection that depends on the aggregate state of the economy.

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"Deteriorating fiscal conditions have an adverse impact on the stability of banking systems everywhere... Sovereign risk has emerged as the main challenge to global financial stability."

[Mark Carney and Fabio Panetta, 2011]

"The emergence of doubt about the ability of sovereigns to manage their debt undermines the perceived soundness of the banks, both directly, because the latter hold much of the debt of the former, and indirectly, via the dwindling value of the sovereign insurance."

[Martin Wolf, 2011]

1. Introduction

As the recent financial crisis entered a far more virulent phase around the time of Lehman Brothers' bankruptcy in late September 2008, the most powerful response of monetary authorities, in combinations with fiscal authorities, took the form of policies that applied to the financial and banking systems (Mishkin, 2011). Governments made extensive use of bank bailouts, both collective and individual; some guarantees were explicit, others were implicit; some financial institutions were bailed out, others were not (e.g., Panetta et al., 2009). It has been argued that bank bailouts reduced the tail risk of financial institutions, making them safer, and helped curb the turmoil in financial markets; thus, in safe-haven countries such as the US, government guarantees generated beneficial effects for banks, and helped reduce bank funding costs (Gandhi and Lustig, 2015; Kelly et al., 2016). However, such policies might have also contributed to increase banks' exposures to aggregate risk, in two ways. First, government support hindered the fiscal capacity of some sovereigns, and the resulting sovereign fragility, in turn, fed back to the banks (Acharya et al., 2014). Second, guarantees might have made banks exposed to policy uncertainty, a source of non-diversifiable risk (Pástor and Veronesi, 2013).

Banks are not, however, equally exposed to the risks affecting their guarantor, and therefore to aggregate risk. For example, Correa et al. (2014) show that sovereign credit rating downgrades have a large and negative effect on the stock returns of those banks that are more likely to receive stronger support from their governments. Also, the guarantees seem to reduce the exposure of bondholders to bank risk, as the spread-to-risk relation weakens with the too-big-to-fail status (Acharya et al., 2016). These findings, taken together, suggest that government support makes guaranteed banks exposed to sovereign risk and less sensitive to measures of intrinsic bank riskiness. Therefore, government guarantees tend to alter the source of bank risk; for the banks benefiting from guarantees, the amount of idiosyncratic risk drops, but that of aggregate risk can potentially increase through their exposure to sovereign risk. We conjecture that this shift in the source of bank risk can impact on bank risk premiums, possibly attenuating the beneficial effects of government guarantees. In this paper, building on these earlier studies, we revisit the asset-pricing implications of government guarantees using an international perspective; put simply, guarantees are not certain in all countries, and cross-sectional variation in the strength of the guarantees across countries can, in turn, affect the cross-section of international bank risk premiums.

We develop a tractable theoretical framework to characterize the risk-return trade-off that government guarantees can generate in bank asset returns. We bring together the model of Bester and Hellwig (1987) that features risk taking but no guarantees, with a more recent strand of the theoretical asset-pricing literature on government policies and guarantees (Pástor and Veronesi, 2013; Acharya et al., 2014; Gandhi and Lustig, 2015; Kelly et al., 2016). We show that when implicit guarantees are risky – that is they vary with the aggregate state of the economy – an increase in the strength of a bank's guarantee, for a given riskiness of the bank, has an ambiguous effect on the risk premium commanded by the bank's equity and debt claims. On the one hand, a stronger guarantee ensures a higher payoff to debt and equity holders, which acts to compress risk premiums. On the other hand, if the implicit support offers higher protection in "good" than in "bad" states of the world, it can make the payoff of debt and equity claims more positively correlated with the aggregate state of the economy, raising risk premiums. These direct effects of the guarantee arise even separately from the indirect effects operating through risk taking.

The theoretical framework also shows that stronger implicit support can be associated with higher risk premiums of the guaranteed claims only if the guarantee is sufficiently risky, which could be due to sovereign risk or, more generally, to uncertainty about government support. The theoretical framework illustrates conditions under which an individual bank's implicit guarantee depends on the market share of its deposits, paving the way to test the theoretical predictions. Moreover, the optimally chosen implicit support in our framework is greater in "good" than in "bad" states of the world, even though the government's willingness to support banks does not vary across states. Intuitively, the procyclicality of the implicit support relates to the fact that weaker public finances in recessions can constrain the government's ability to support banks.

Our empirical analysis is organized around this simple theoretical framework and tests its predictions on the direct effects of implicit guarantees using data for 88 banks, covering 15 countries, over the sample period from January 2004 to November 2018. We use standard portfolio-sort techniques: consistent with the theory, to isolate the direct effects of the guarantee, we double-sort banks first by bank risk, and then by a measure of expected government support (EGS), namely the deposit-to-GDP ratio, which proxies for the bank market share of deposits. Intuitively, banks with high deposit-to-GDP ratios benefit from stronger EGS as the failures of these banks can adversely affect not only the financial system, but also the real economy. Indeed, we find that banks with higher deposit-to-GDP ratios are more exposed to sovereign risk than banks with low deposit-to-GDP ratios. Thus, in both our theoretical framework and empirical analysis, guaranteed banks are characterized by high levels of deposits relative to the size of the national economy. That is, differently from the too-big-to-fail literature, we focus on the importance of the guaranteed banks for the national economy, rather than on their systemic importance at the global level. We also depart from previous studies that use the rating uplift to measure the bank EGS, as we employ a measure that is more likely to be exogenous to bank asset returns and sovereign risk, which makes it particularly suitable for testing the theoretical predictions using an international panel of banks.[1]

We perform the empirical analysis on a set of reasonably large banks based in developed countries. In this way, we can exploit the cross-sectional variation in terms of sovereign risk, complementing the existing literature that typically focuses on the US alone (Gandhi and Lustig, 2015). For a given country, we select those banks for which senior credit default swap (CDS) data are available. We then also obtain the equity prices for these banks. In this way, we can test the theoretical predictions on both bank debt and equity returns; this combined use of CDS and equity data is also a distinctive feature of our study. The sample period is constrained by the low liquidity of the CDS market prior to 2004. For this reason, we carry out the core empirical analysis over the 2004-2018 sample period.

Our empirical results suggest that equity spread portfolios – high minus low deposit-to-GDP portfolios – deliver economically large and statistically significant returns; this return can reach 11% per annum. These spread portfolios are the main object of interest as they are self-financed and contain banks of similar riskiness, thus isolating the direct effect of EGS on bank returns. Hence, we can use the spread portfolios to examine the testable predictions implied by the theoretical framework. Even allowing for a reasonably large set of pricing factors, we find that these risk factors fail to explain the spread portfolio returns: equity spread portfolio returns are largely unchanged on a risk-adjusted basis. Thus, based on a set of standard risk factors, there is a puzzle in bank returns. However, we uncover a clear factor structure in the risk-adjusted returns of the double-sorted portfolios, i.e. sorted on bank risk

[1]The rating uplift is measured as the difference between the bank's ability to repay its deposit obligations that also accounts for the EGS (*all-in-all* rating) and the bank's intrinsic safety and soundness (*stand-alone* rating). In essence, the rating uplift should capture the probability of support conditional on the bank failing without support. However, this measure increases not only with the market share of deposits of the bank, but also with the intrinsic riskiness of the bank and the solvency of the domestic sovereign. These latter features make undesirable the use of the rating uplift as sorting variable in our study.

and EGS. In particular, the weights associated with the third principal component (PC) align well with the equity risk-adjusted returns: they are positive for high deposit-to-GDP banks, and negative for low deposit-to-GDP banks. This finding holds qualitatively both for equity and CDS portfolios. Thus, the third PC is a natural candidate to complete the set of pricing factors.

Instead of working directly with the PC factor, in most of the empirical analysis, we use an EGS return factor. To do so, we simply multiply the double-sorted portfolio excess returns by the weights associated with the third PC. As a result, the EGS return factor is tradable by construction, so that its expected return (or price of risk given that it has unit exposure) is simply its mean. We find that it averages about 11% per annum, and is statistically significant. When we repeat the time-series (first-pass) regressions including this additional factor, a number of interesting results emerge. First, the spread portfolios load positively on the EGS factor, and these exposures are precisely estimated, for both equities and CDSs; thus, the EGS risk premium is priced consistently in both markets. Second, there is no longer a puzzle in bank equity returns, given that the *alphas* on the equity spread portfolios become small in economic terms, and their statistical significance either drops substantially or disappears depending on the sample considered.

Moreover, the cross-sectional (second-pass) regressions reveal that, by including the EGS return factor, we can price a cross section of 36 test assets, consisting of the double-sorted, as well as the spread, equity and CDS portfolios. In particular, when we include the EGS factor in the pricing model, the R^2 increases by roughly 20 percentage points and the mean absolute error (MAE) halves. Taken together, these findings show that the equity risk premium associated with the government guarantee is in the range of 5-9% per annum. However, the subsample analysis also reveals that this premium is substantially higher when we exclude the period following the adoption of the bail-in regime by EU members, consisting of the last five years of our sample. Under the bail-in regime bondholders and/or depositors, rather than taxpayers, are forced to bear the burden of bank recapitalizations. In principle, during a fully operational bail-in regulation, the key mechanism underneath our theoretical framework should either no longer be at play or be far less prominent. Our findings of a higher risk premium in the period prior to the bail-in regime show that the adoption of the bail-in regulation led market participants to reassess this aspect of the sovereign-bank nexus. We also find that, prior to the onset of the sub-prime crisis, there was no evidence of an EGS premium.[2]

[2] This evidence is also confirmed when we analyze a sample of equities only (i.e. removing CDS data from the analysis), which allows us to extend the analysis back to 2000. This finding accords well with the fact that rating uplifts were also small prior to the onset of the crisis.

These results establish the existence of an EGS risk premium. Moreover, as suggested by the theoretical framework, an EGS premium appears to exist only when banks can be bailed out and sovereign risk is non-negligible. To further characterize the EGS risk-return trade-off, we show that sovereign risk is central to our results. When we focus on the sample of banks based in core EU countries, we find that the EGS risk premium is substantially larger and more precisely estimated. We also show that EU banks drive the result that such premium is absent in the bail-in regime. By contrast, when we restrict the analysis to banks based in the safest sovereigns in our sample (US, Germany, Japan, Switzerland), no such premium exists. These findings are consistent with the theoretical prediction that more uncertain guarantees are associated with higher risk premiums.

Finally, we complement the analysis of sovereign risk with three additional exercises. First, we show that the main turning points of the EGS return factor are associated with key policy events that took place during the sample. It is possible to identify five distinct phases, which indicate that the premium seems to arise during the 2007-13 period, when governments made extensive use of bailouts.[3] Second, we illustrate through a simple graphical analysis the main intuition behind the theoretical framework: the EGS return factor drops when sovereign risk increases, and vice versa, confirming that sovereign risk is an important determinant of the EGS factor. We find that the factor also drops when US economic policy uncertainty increases. On the contrary, high EGS banks are less exposed to tail risk than low EGS banks, given that the factor comoves positively with innovations to the VIX index. Thus, although government guarantees offer protection from tail risk, as in Gandhi and Lustig (2015) and Kelly et al. (2016), they expose banks to sovereign risk and policy uncertainty. This finding also contributes to the ongoing debate about the disconnect between VIX and policy uncertainty (see, e.g., Pástor and Veronesi, 2017). Third, a horse race shows that the EGS factor comoves with bank portfolios sorted on variables that reflect sovereign risk, sovereign exposures and other proxies for EGS. Taken together, these additional exercises provide further evidence on the existence of an EGS risk-return trade-off, consistent with the theoretical framework, which arises when sovereign risk (or uncertainty about government support) is sufficiently high. Finally, a simple exercise seems to suggest that the indirect effects of the guarantees on bank risk premiums are less economically relevant than the direct effects.

Related literature. The sovereign-bank nexus and its implications for financial stability are at the center of an active debate among policy makers and academics alike. Historically,

[3] We refer the reader to Panetta et al. (2009) for a comprehensive assessment of financial sector rescue programmes across the world during the global financial crisis, whereas European Commission (2017) covers the 2008-2015 period with a focus on Europe.

the link between the state and the banking system has been umbilical, with causality reversing on a few occasions (Haldane and Alessandri, 2009). Even during the recent global financial crisis, causality has reversed. At first, system-wide rescue packages led to a transfer of credit risk from the banks to the sovereigns. Thereafter, the guarantees hindered the fiscal capacity of governments, and such sovereign fragility eventually fed back to the banks (Acharya et al., 2014). Furthermore, banks are not equally exposed to sovereign/aggregate risk (Correa et al., 2014; Acharya et al., 2016). In this paper, we show that the shift in the type of bank risk generated by government guarantees can have important asset-pricing implications, given that only the exposure to non-diversifiable risk should command a risk premium. Indeed, risk-averse investors demand a premium for holding assets whose payoff is positively correlated with the aggregate state of the economy, as they provide poor insurance in "bad" states of nature.

A similar mechanism is present also in Pástor and Veronesi (2013), although their focus is more generally on government policies. On the one hand, uncertainty about future government actions could have a positive effect if the government responds adequately to unanticipated shocks. This effect parallels the protection provided by government guarantees to banks. On the other hand, political uncertainty is non-diversifiable by investors and, for this reason, commands a positive risk premium. A similar mechanism arises in our framework due to the riskiness of the guarantee. Although our study relates to this stream of literature, it rests on a different theoretical framework, and uses a substantially different empirical methodology to test the theoretical predictions. A key difference from Pástor and Veronesi (2013) is that our focus is on cross-sectional differences in bank risk premiums, rather than on the market-wide equity risk premium.[4]

Our study also closely relates to Gandhi and Lustig (2015) and Kelly et al. (2016); however, it differs under a number of key dimensions. Kelly et al. (2016) relate, both theoretically and empirically, the surge in the basket-index put spread in 2007-09 to the introduction of collective guarantees. They argue that in a systemic crisis, and in the absence of such guarantees, the spread should have otherwise dropped. In Gandhi and Lustig (2015), a realization of a disaster event can trigger a collective bailout of larger banks, but not of smaller banks: this is why larger commercial banks have lower risk-adjusted returns. Similarly, in Gandhi et al. (2017), larger banks benefit from a collective government guarantee, the strength of which depends on the characteristics of the guarantor; for example, it is taken to be increasing in the fiscal health of the government. Consequently,

[4]More specifically, while in our paper changes in risk premiums are due to the fact that guarantees alter banks' exposures to aggregate risk, holding the price of risk constant, in Pástor and Veronesi (2013) political uncertainty makes the price of market risk state dependent, holding the exposure constant (given that the effects are evaluated on the market index that has unit exposure by definition).

larger banks in fiscally strong countries earn lower risk-adjusted returns than smaller banks. However, the guarantee is not state-contingent, and has no effect on the risk taking of banks. We instead show, both theoretically and empirically, that when the analysis is extended to banks guaranteed by a risky sovereign, the result can potentially be reversed, regardless of any indirect effects due to the risk taking of banks. Put simply, while in Gandhi and Lustig (2015) government guarantees make larger commercial banks less exposed to aggregate risk, in our study, if the risks associated with guarantees are sufficiently high, they can raise banks' exposures to non-diversifiable risk. Thus, we differ from these studies as in our framework government guarantees are risky in the sense of providing protection that depends on the aggregate state of the economy.

Another strand of the literature has examined the presence of a risk-taking channel associated with the guarantees. A priori the effect of this channel is ambiguous. On the one hand, government support reduces market discipline, i.e. the incentive of outside investors to monitor, and therefore increases the risk taking of protected banks. On the other hand, by reducing bank funding costs, government support should increase the charter value of the bank, and as a result diminish the bank's incentive to take on risk. While the empirical evidence is mixed for high EGS banks, outright publicly owned banks, as well as the competitors of banks benefiting from EGS, seem to take on risk (Gropp et al., 2011; Altavilla et al., 2017; Brandao-Marques et al., 2018). In our theoretical framework, we model risk taking à la Bester and Hellwig (1987) to account for potential indirect effects of the guarantee operating through this separate channel, although the main focus is on the direct effects of the guarantee on bank risk premiums.

Finally, a large number of studies has referred to bank holdings of sovereign debt, i.e. direct sovereign exposures of banks, to explain how sovereign fragility transmits to banks. For example, in Gennaioli et al. (2014) the distressed state of public finances can endanger the stability of the private domestic banking sector through their holdings of domestic sovereign debt. Similarly, in Brunnermeier et al. (2016) home bias of banks' sovereign debt portfolios makes their equity value and solvency dependent on swings in the perceived solvency and market value of government debt. Our theoretical framework uncovers a different channel, which does not require banks to hold government debt.

The paper is organized as follows. We start by presenting the theoretical framework and its two testable predictions in Section 2. We then present the data and portfolio sorting strategy in Section 3. Section 4 reports the main empirical findings. First, we show that an EGS risk premium exists, and then that this premium relates to EGS banks' exposures to sovereign risk. Finally, Section 5 concludes the paper. An Appendix provides technical details, and a separate Internet Appendix presents additional robustness exercises.

2. Theoretical framework

Our theoretical examination of the effects of implicit government guarantees on bank risk premiums builds on the framework of Bester and Hellwig (1987), which features a principal-agent problem with a focus on risk taking.[5] We deem this to be an important feature as risk taking has been suggested to be directly influenced by government guarantees (Brandao-Marques et al., 2013, among others). Risk taking arises in the framework of Bester and Hellwig (1987) due to a two-dimensional moral-hazard problem. The agent chooses a risk class and an effort level, neither of which can be observed by the principal. These two dimensions of moral hazard correspond to the agency costs involved in outside finance identified by Jensen and Meckling (1976): moral hazard taking the form of excessive risk taking arises in the presence of debt, while equity finance is associated with moral hazard involving suboptimal effort.

When considering both debt and equity finance, it is natural to consider a model à la Bester and Hellwig (1987), combining the two types of moral hazard. In such a model, managers can compensate for exerting less effort by choosing riskier assets. Due to this feature, as pointed out by Hellwig (2009, p. 496), "risk choices and effort choices are two sides of the same coin. It makes no sense to talk about their agency costs separately." Due to the two-dimensionality of the moral hazard problem, excessive risk taking arises as an equilibrium outcome in Bester and Hellwig (1987) despite the fact that the financing contract between the managers and the outside investors can take any form. Differently, a model that considers only one of the two dimensions of moral hazard would not give rise to such an outcome. Rather, the outside investors would have full control over the choices of the managers by appropriately specifying the financing contract. As a result, the contracting problem between the managers and the investors would involve no agency costs. For this reason, observed financing patterns could no longer be explained as optimal responses to problems arising from agency costs.[6]

The model of Bester and Hellwig (1987) has the added advantage of speaking to capital structures that can emerge as responses to problems of asymmetric information. The

[5]Tirole (2006) provides a discussion of the mechanisms present in the framework of Bester and Hellwig (1987). Hellmann and Stiglitz (2000), Hellwig (2009), and At and Thomas (2017) employ similar frameworks to study risk taking and related issues.

[6]Leland (1994) and its many extensions focus explicitly on other determinants of capital structure than agency costs. Recent contributions to this literature, such as Chen and Kou (2009), show how the optimal capital-structure problem can be solved even under very flexible distributional assumptions. In frameworks that extend Leland (1994) by introducing risk taking, such as Leland (1998), risk choices are analyzed in the context of somewhat less flexible financing contracts than in Bester and Hellwig (1987).

second-best financing contract between managers and investors in their framework can be implemented with a combination of debt and equity. In this sense, their results can be interpreted to imply a determinate capital structure. Importantly, the framework of Bester and Hellwig (1987) is also tractable enough to allow for both the introduction of government guarantees and the derivation of closed-form expressions for the object of our ultimate interest, that is, bank risk premiums.[7]

In Section 2.1, we present the economic environment, which extends Bester and Hellwig (1987) along two dimensions. First, we specify both the objective and the risk-neutral probability distribution of the state of the world, which is instrumental to quantify risk premiums. Second, we introduce government guarantees, so that we can study how they affect risk premiums, both *directly* through the protection they provide and *indirectly* by altering the risk-taking behavior of banks.

In Section 2.2, after having examined the effects of government guarantees on bank risk taking, we characterize how they influence bank risk premiums. We first consider the case of non-state-contingent guarantees, before turning to the more general case of risky guarantees, i.e. guarantees that vary across the states of the world. These two cases are useful to illustrate the mechanisms at play in our framework; some of the mechanisms absent from the framework are discussed at the end of the section. In Section 2.3, we shed light on the factors that determine the strength of government guarantees, which will help guide the subsequent empirical analysis. The two main testable predictions, which focus on the direct effects of the guarantees on bank risk premiums, are stated in Section 2.4.

The analysis reveals two different channels through which implicit government guarantees can be associated with risk premiums. First, the insurance offered by guarantees makes investors more "tolerant" to being only partially reimbursed by the banks they finance. As a result, bank managers invest in riskier assets and this is reflected in the risk premium demanded by the investors. Second, if the implicit guarantee is risky in that its strength varies across the aggregate states of the economy, it will command a risk premium. In this case, the risk premium associated with the guarantee is a function of the state of public finances and potential uncertainty about government support. This second channel operates even when abstracting from risk taking, i.e. when comparing risk premiums of banks of similar riskiness. For this reason, it is the focus of our empirical analysis.

[7] While introducing risk taking in models à la Leland (1994) that feature government guarantees, such as Albul et al. (2016) and Chen et al. (2017), would allow for a richer analysis of capital structure, the effect of government guarantees on risk premiums could not be derived in closed form. A separate strand of the literature relies on rare disaster models to derive rich predictions on bank risk premiums in the presence of government guarantees (see, e.g., Gandhi and Lustig, 2015; Kelly et al., 2016; and, Gandhi et al., 2017). However, these models only consider non-state-contingent guarantees and abstract from the modeling of capital structure and of risk taking, as the value of the bank follows an exogenously specified process.

2.1. Economic environment

We consider the following environment, in which no arbitrage opportunities are assumed to exist.

Stochastic environment. The state of the world $\omega \in \mathbb{R}$ is distributed according to a continuous (objective) probability distribution function $F(\cdot)$. The absence of arbitrage implies the existence of an equivalent risk-neutral probability measure (Dalang et al., 1990). The probability distribution function of the state of the world under the risk-neutral measure is denoted by $G(\cdot)$, which, by being equivalent to the objective measure, is also continuous.

Technology and agents. We consider a bank whose managers are subject to double moral hazard, as in Bester and Hellwig (1987). Namely, the asset payoff of the bank depends on both the effort exerted by the managers and the risk class of the bank's assets chosen by them. Specifically, the managers choose a threshold $\bar{\omega}$ that is such that the assets yield a positive payoff if and only if $\omega \geq \bar{\omega}$. Thus, for any given threshold $\bar{\omega}$, the risk-neutral probability of obtaining a positive payoff is equal to $1 - G(\bar{\omega}) =: p$. Due to $G(\cdot)$ being continuous, equivalently, the managers choose $p \in [0, 1]$, with lower values of p corresponding to riskier assets. Interpreted literally, the probability p determines, in the absence of government support, the failure risk of the bank. Thus, a decrease in p, which implies a higher failure risk, is associated with an increase in risk taking. However, we prefer to interpret the parameter as pinning down the riskiness of the bank's assets in a wider sense. This interpretation is supported by the fact that, as will be shown, the risk premium required by investors of the bank depends only on $\bar{\omega}$, or equivalently p, chosen by the bank managers. Moreover, under a mild restriction, the risk premium is decreasing in p. For any p and $\omega \geq \bar{\omega}$, the asset payoff is proportional to $-\ln p$. This functional form captures the idea that riskier assets offer higher upside returns and is chosen for the sake of tractability. The bank managers can increase the payoff by exerting effort. This second dimension of moral hazard makes it impossible to eliminate excessive risk taking by adjusting the financing contract between the managers and the investors. Moreover, as pointed out by Hellwig (2009), adding the second dimension delivers a model in which the two types of moral hazard first analyzed by Jensen and Meckling (1976) are formally combined. When $\omega \geq \bar{\omega}$ a level of effort equal to $a > 0$ produces a payoff of $(-\ln p)a^{\beta}$, with $\beta < 1$, but it involves a cost equal to a for the managers.[8] Thus, the expected asset payoff under the risk-neutral measure, net of the effort cost, is equal to

$$p(-\ln p)a^{\beta} - a. \tag{1}$$

[8]We consider this parameterized setting as the double moral-hazard problem formulated more generally is not tractable (Bester and Hellwig, 1987; Tirole, 2006).

The managers need to raise an exogenously fixed amount of funds equal to I from outside investors. This amount can be interpreted as the difference between the size of the balance sheet of the bank and its internal funds, both of which are determined exogenously. Both managers and investors maximize their expected payoffs under the risk-neutral measure.[9]

Financing contract. The investors do not observe the pair (a, p) chosen by the managers but only the realized asset payoff. Thus, the contract between the investors and the managers can be contingent only on the realized payoff, which is equal to either 0 or $(-\ln p)a^{\beta}$.[10] The bank managers are protected by limited liability. To control the choices of the managers, the investors can specify a contract that stipulates a payoff to the managers for each level of the realized asset payoff. Given the risk class and effort choices associated with each realized payoff, the investors set the payoffs to be such that the managers choose the pair (a, p) preferred by the investors. Specifically, the investors can specify a contract that delivers a positive payoff to the managers only if the realized asset payoff is equal to the level, denoted by π, preferred by the investors. Denoting the payments to the managers and the investors in this contingency by π_b and π_l, respectively, satisfying $\pi = \pi_b + \pi_l$, the managers' problem becomes

$$\max_{\{a,p\}} p\,\pi_b - a \qquad \text{subject to} \qquad (-\ln p)a^{\beta} = \pi. \tag{2}$$

This formulation shows that the managers can compensate for exerting less effort by choosing riskier assets, which is the potential distortion arising from asymmetric information between the investors and the managers.

Government guarantee. The investors obtain the contractually specified payment π_l whenever $\omega \geq \bar{\omega}$, and are protected by a government guarantee whenever $\omega < \bar{\omega}$. Namely, when the bank's assets yield a payoff equal to 0, the investors obtain $\alpha\tau(\omega)$ from the government. We interpret α as measuring the strength of the guarantee, i.e. the government's willingness to support the bank, whereas the state-dependent component $\tau(\omega)$ captures, among other things, the riskiness of the guarantee, being a function of the guarantor's exposure to aggregate risk. Although the level of the guarantee clearly depends also on $\tau(\omega)$,

[9] That is, investors and managers are equally averse to risk; see Philippon and Sannikov (2007) for a discussion about this assumption.

[10] Note that without the second dimension of moral hazard (i.e., the effort choice), corresponding to the case in which $\beta = 0$, the positive realization of the payoff would perfectly reveal p chosen by the managers. Consequently, the investors could have full control over p chosen by the managers. Offering the following financing contract will constrain the managers to choose the risk class preferred by the investors, say p^*. The managers obtain a payoff of $\epsilon > 0$ when the realized payoff is equal to $-\ln p^*$ and 0 otherwise. Were the managers to choose $p \neq p^*$, they would obtain a payoff of 0 in all states of the world. This strategy is dominated by choosing p^*, which yields a strictly positive expected payoff. By letting $\epsilon \to 0$, the investors can also extract all the surplus, leaving no information rents to the managers. Consequently, the case of $\beta = 0$ involves no agency costs. For this reason, it is uninteresting for our purposes as agency costs, in the tradition of Jensen and Meckling (1976), are central to our analysis of risk taking.

perturbing the distribution $\tau(\cdot)$ in a mean-preserving manner allows us to examine the role played by the riskiness of the guarantee. While $\tau(\omega)$ is common to all banks guaranteed by the same government, thus varying only across countries, α is allowed to vary across both banks and countries, but not across the states of the world. Decomposing the guarantee into these two components allows us to distinguish between effects due to its strength and riskiness.[11] The investors' problem is

$$\max_{\{\pi_b,\pi_l\}} \alpha \int_{-\infty}^{\bar{\omega}} \tau(\omega)\mathrm{d}G(\omega) + p\,\pi_l - I, \tag{3}$$

subject to p, and therefore $\bar{\omega}$, being chosen optimally by the managers. While the first term in Eq. (3) represents the investors' payoff attributable to the guarantee, the second reflects the fact that the bank's assets yield a positive payoff when $\omega \geq \bar{\omega}$. Given that $\pi = \pi_b + \pi_l$, by choosing the two payoffs the investors constrain the choices of the managers.

The timing of actions is such that the implicit guarantee is determined before the financing contract is stipulated, which in turn precedes the effort and risk class choices of the managers. In this way, risk taking can respond to the government guarantee. Fig. 1 illustrates the timing in the model. Before proceeding further, let us point out that for $F(\cdot) = G(\cdot)$ and $\alpha = 0$ the model becomes identical to that of Bester and Hellwig (1987). This feature makes it straightforward to discern how the presence of the guarantee affects risk taking.

2.2. Effects of government guarantees

As a prelude to our analysis of risk premiums, we investigate how the guarantee affects bank risk taking. In this way, we are able to better understand the different mechanisms through which the guarantee influences risk premiums.

2.2.1. Risk taking

Considering the effect of an increase in the strength of the guarantee α on the managers' choice of the risk class of the bank's assets p, we obtain the following result.

Lemma 1 *An increase in the strength of the guarantee α leads to the managers choosing a lower p, corresponding to riskier assets.*

[11] Alternatively, we could set α equal to 1 and define the strength of the guarantee in terms of the distribution of $\tau(\cdot)$. However, we prefer introducing the parameter α to this solution because the distribution of $\tau(\cdot)$ encodes how the guarantee varies across the states of the world, thus determining the riskiness of the guarantee. Therefore, we perturb the distribution of $\tau(\cdot)$ only when we study how bank risk premiums depend on the riskiness of government support.

Stronger guarantees being associated with more risk taking is intuitive. The guarantee makes the investors more "tolerant" to the bank's assets yielding a zero payoff. Consequently, the investors design a financial contract that induces the managers to take more risk, i.e. to choose a lower p.

Importantly, as in Bester and Hellwig (1987), the contract between the investors and the managers can be implemented by a combination of debt and equity finance. Suppose the investors and the managers stipulate a debt contract specifying a reimbursement, and additionally agree that a share of profits net of interest payments is paid to the investors. Then, the contract underlying Lemma 1 can be implemented by appropriately choosing the reimbursement and the share of profits. In other words, we can think of the investors as holding a portfolio comprising an equity and a debt claim on the bank. In what follows, we quantify the risk premium on this portfolio held by the investors.

To conclude our analysis of risk taking, we investigate how the payoff obtained by the investors when $\omega \geq \bar{\omega}$ varies with the risk class of the bank's assets p. We obtain the following result.

Lemma 2 *The payoff π_l is decreasing in p.*

Lemma 2 completes the picture of how the guarantee affects the investor's claim on the bank by altering risk taking behavior. Consequently, we can characterize how the guarantee influences the risk premium commanded by the claim both directly and indirectly through its effect on risk taking, to which we turn next. However, before doing so, we introduce a natural restriction on the guarantee $\alpha\tau(\omega)$ for all ω. Namely, we require it to be below the positive payoff π_l obtained by the investors when $\omega \geq \bar{\omega}$. Given that π_l is decreasing in p by Lemma 2, a sufficient condition is that the guarantee $\alpha\tau(\omega)$ is lower than the payoff π_l obtained by the investors in the absence of the guarantee.[12]

2.2.2. Risk premiums

Having derived the implications of the guarantee on risk taking, we can analyze its effects on risk premiums. It is, however, useful to first derive the risk premium of the investor's claim on the bank in the absence of a government guarantee. This premium can be easily quantified. Under no-arbitrage, the price of any claim is equal to its expected payoff under the risk-neutral measure, discounted at the risk-free rate. Thus, the price of the investors' claim is equal to $\pi_l \left[1 - G(\bar{\omega})\right] / \bar{R}$, where $\bar{R}$ is the (gross) risk-free rate. Its expected payoff, on the other hand, is $\pi_l \left[1 - F(\bar{\omega})\right]$. Thus, the risk premium, or excess return, of the investors'

[12]In the absence of the guarantee, $\pi_l = (1-\beta^2)\left[\beta^2(1+\beta)^2 e^{-(1+\beta)}\right]^{\frac{\beta}{1-\beta}}$.

claim in the absence of a government guarantee is

$$\begin{aligned} \mathbb{E}[R_l] - \bar{R} &= \frac{1 - F(\bar{\omega})}{1 - G(\bar{\omega})} \bar{R} - \bar{R} \\ &= \frac{G(\bar{\omega}) - F(\bar{\omega})}{1 - G(\bar{\omega})} \bar{R}. \end{aligned} \tag{4}$$

Note that the risk premium depends only on $\bar{\omega}$, which determines the risk class of the bank's assets, and not on the effort exerted by the managers. This result is intuitive as the effort choice only affects the magnitude of the positive payoff. When the state of the world ω under the objective measure first-order stochastically dominates ω under the risk-neutral measure, i.e. $F(\bar{\omega}) \leq G(\bar{\omega})$ for all $\bar{\omega}$, the risk premium in Eq. (4) is always positive. The required relation of stochastic dominance can be viewed as a sufficient condition for the market risk premium to be positive (Ross, 2015). We assume throughout that this relation holds. Also note that the risk premium in Eq. (4) is increasing in $\bar{\omega}$ whenever the state of the world ω under the objective measure hazard rate dominates ω under the risk-neutral measure.[13] Given that hazard rate dominance is only a slightly stronger restriction than first-order stochastic dominance, this observation further supports the interpretation of higher values of $\bar{\omega}$ corresponding to riskier assets. We can now turn to analyze the effects of government support on risk premiums, starting with the simpler case of a non-state-contingent guarantee.

Case I: Non-state-contingent guarantee. When the guarantee is constant across the states of the world, the investors obtain a non-zero payoff also when $\omega < \bar{\omega}$. Denoting the non-state-contingent guarantee by $\alpha\tau$, the expected payoff of the investors' claim in this case is equal to $\alpha\tau F(\bar{\omega}) + \pi_l [1 - F(\bar{\omega})]$. Thus, the risk premium of the investors' claim on the bank takes the following form

$$\begin{aligned} \mathbb{E}[R_l] - \bar{R} &= \frac{\alpha\tau F(\bar{\omega}) + \pi_l [1 - F(\bar{\omega})]}{\alpha\tau G(\bar{\omega}) + \pi_l [1 - G(\bar{\omega})]} \bar{R} - \bar{R} \\ &= \frac{(\pi_l - \alpha\tau) [G(\bar{\omega}) - F(\bar{\omega})]}{\alpha\tau G(\bar{\omega}) + \pi_l [1 - G(\bar{\omega})]} \bar{R}. \end{aligned} \tag{5}$$

Note that this risk premium is positive as $F(\bar{\omega}) \leq G(\bar{\omega})$, by first-order stochastic dominance, and $\pi_l > \alpha\tau$, by assumption. We are interested in characterizing how Eq. (5) varies with α. Building on Lemmas 1 and 2, we obtain the following result.

Proposition 1 *An increase in the strength α of a non-state-contingent guarantee has an*

[13] Differentiating the risk premium in Eq. (4) with respect to $\bar{\omega}$, one notices that the risk premium is increasing in $\bar{\omega}$ when $G'(\bar{\omega}) [1 - F(\bar{\omega})] - F'(\bar{\omega}) [1 - G(\bar{\omega})] \geq 0$, which is equivalent to the stated condition of hazard-rate dominance.

ambiguous total effect on the risk premium commanded by the investors' claim on the bank.

The effect of the guarantee on the risk premium required by the investors is ambiguous, due to two opposing effects. On the one hand, by Lemma 1, stronger guarantees are associated with more risk taking. The managers of the bank investing in riskier assets, in turn, has two effects. First, an increase in the payoff π_l, obtained by the investors when $\omega \geq \bar{\omega}$, results in higher variability of the investor's payoff and, as a consequence, in a higher risk premium. Second, more risk taking implies a lower probability that the investors obtain π_l; whenever $G'(\bar{\omega}) \geq F'(\bar{\omega})$, this effect also leads to a higher risk premium.[14]

On the other hand, for a given level of risk taking, the guarantee has a direct negative effect on the risk premium of the claim held by the investors. This effect arises as the guarantee makes the investors less exposed to aggregate risk, as it ensures them a positive payoff when $\omega < \bar{\omega}$. Such a negative effect of the guarantee on the risk premium required by the investors is also present in Gandhi and Lustig (2015), Kelly et al. (2016) and Gandhi et al. (2017). Although in substantially different setups, they consider guarantees that are non-state-contingent, as we do here.[15] As we will show in what follows, when the guarantee is instead risky, i.e. varies across states of the world, the direct effect of the guarantee on risk premiums can be of the opposite sign.

Case II: State-contingent guarantee. When the guarantee varies across states of the world, the risk premium of the investors' claim on the bank, following analogous steps as above, can be written as

$$\mathbb{E}[R_l] - \bar{R} = \left\{ \frac{\alpha \int_{-\infty}^{\bar{\omega}} \tau(\omega) \mathrm{d}F(\omega) + \pi_l \left[1 - F(\bar{\omega})\right]}{\alpha \int_{-\infty}^{\bar{\omega}} \tau(\omega) \mathrm{d}G(\omega) + \pi_l \left[1 - G(\bar{\omega})\right]} - 1 \right\} \bar{R}. \tag{6}$$

For future reference, we term the ratio $\int_{-\infty}^{\bar{\omega}} \tau(\omega)\mathrm{d}F(\omega) / \int_{-\infty}^{\bar{\omega}} \tau(\omega)\mathrm{d}G(\omega)$ the *risk premium of the guarantee*, that is, the risk premium commanded by the transfer attributable to the guarantee obtained by the investors, $\mathbb{1}_{\{\omega<\bar{\omega}\}}\alpha\tau(\omega)$. Due to the state contingency of the guarantee, its direct effect on risk premiums is no longer necessarily negative. In other words, stronger guarantees can imply higher risk premiums even when abstracting from any indirect effects of the guarantee operating through risk taking. Such a positive association requires the guarantee to be sufficiently risky, as measured by the risk premium of the guarantee, which in turn reflects the exposure of the guarantor to aggregate risk.

[14] Intuitively, the condition $G'(\bar{\omega}) \geq F'(\bar{\omega})$ requires that $\bar{\omega}$ chosen by the managers corresponds to a "bad" state of the world, which is deemed to be more likely under the risk-neutral than the objective probability measure.

[15] Note that here we simply require the guarantee not to vary across the states of the world, rather than requiring it to be deterministic. Specifically, the guarantee could be non-deterministic as in Kelly et al. (2016), meaning that in each state of the world the investors obtain a transfer with a given probability. Indeed, if α were a probability, none of the results presented in this section would change.

Proposition 2 *Both the direct and the total effect of an increase in the strength α of a state-contingent guarantee on the risk premium commanded by the investors' claim on the bank are ambiguous.*

Intuitively, the possibility of the direct effect of the guarantee being positive arises from the guarantee being risky. More specifically, if the guarantee is procyclical in the sense of providing higher protection in "good" than in "bad" states of the world, it commands a positive risk premium. Thus, an increase in the strength α of the guarantee can, by making the investors more exposed to aggregate risk, lead to an increase in the risk premium of the investors' claim. The guarantee could be procyclical, for instance, because weaker public finances in recessions can constrain the government's ability to support banks and make bailouts harder to justify to taxpayers.

Also note that if the guarantee is risky, its indirect effect, operating through risk taking, is more ambiguous. This finding relates to the fact that an increase in π_l due to more risk taking lowers the risk premium of the investor's claim if the guarantee is riskier than the underlying unguaranteed claim.[16] Thus, the overall effect due to risk taking is less clear cut in this case.

Proposition 2 has the following corollary, which will allow us to formulate an additional testable prediction.

Corollary 1 *Holding constant the level of risk taking, an increase in the strength of the guarantee can lead to an increase in the risk premium commanded by the investors' claim only if the guarantee is sufficiently risky.*

Corollary 1 is derived by assuming that the risk class of the bank's assets does not respond to an increase in the strength of the guarantee, that is, when the mechanism revealed by Lemma 1 does not operate. This mechanism would be absent, for instance, when the risk class of the asset is chosen before the change in the strength of the guarantee takes place. We make this assumption to be able to isolate the direct effect of the guarantee on bank risk premiums, as we do in the empirical analysis by controlling for risk taking.

One can think of the riskiness of the guarantee as depending primarily on the riskiness of the sovereign granting it. An alternative interpretation is that increased uncertainty about which banks and under which conditions will be supported makes implicit guarantees riskier. In Section 2.3, we shed more light on how a guarantee granted by a sovereign depends on its fundamentals, and in particular on its riskiness.

[16]The term multiplying $\frac{\mathrm{d}\pi_l}{\mathrm{d}\alpha}$ in Eq. (A.17) is negative when the risk premium of the guarantee exceeds that of the underlying unguaranteed claim.

Discussion. Before turning to the determinants of the implicit government support, let us discuss some potential limitations of our framework. First, our static model abstracts from any effects operating through charter value. A stronger government guarantee, by lowering refinancing costs, can raise the guaranteed bank's charter value (Gropp et al., 2011), and therefore temper the managers' incentives for risk taking (Keeley, 1990). Thus, in the presence of this mechanism, stronger guarantees would not necessarily imply more risk taking.

Second, guarantees could influence risk taking through general equilibrium effects, which our partial equilibrium framework is not able to capture. In principle, providing support to a bank can affect the stochastic discount factor (SDF) in a number of ways, thus having an effect on the risk-neutral distribution of the state. Note that in our framework, the SDF is given by $\varphi(\omega) = \frac{g(\omega)}{f(\omega)} \frac{1}{R}$. Suppose, for instance, that government support involves a transfer from the taxpayers to the marginal investors. In such a setting, an increase in the strength of the guarantee could lead to a decrease in the SDF in states of the world in which government support is provided.[17] Alternatively, the SDF could be affected through changes in banks' risk taking, induced by increases in the strength of their guarantees. Such an effect would arise if the SDF depended on whether banks are able to repay the investors. Specifically, an increase in the strength of the government support of a bank could lead to an increase in the SDF in the states in which the bank is no longer able to honor its obligations. These two effects on the SDF, taking opposite signs, could in turn influence bank risk premiums, but in a priori ambiguous manner. We leave for future research to formally examine these potential mechanisms.

Finally, although the model we employ allows for the coexistence of debt and equity, it is not possible to obtain a clear-cut characterization of their risk premiums if considered separately. The reason is that, when implementing the contract between the managers and the investors with a combination of debt and equity finance, their weights in the investors' portfolio vary in a non-trivial manner with the strength of the guarantee. Therefore, it remains a question for future theoretical work whether stronger effects should be expected on debt or equity claims, which could be interesting in light of the previous literature showing that not only the return on debt (e.g., Acharya et al., 2016), but also that on equity (e.g., Gandhi and Lustig, 2015), is affected by government guarantees. We will return to the risk premiums of debt and equity claims in Section 4.1.4.

[17] In a framework in which the SDF is a function of the marginal utility of the investors, this would be the case if investors' consumption were increasing in the strength of the support. More generally, any transfer that leads to a change in aggregate consumption, due for example to differing propensities to consume of the agents involved, would affect the SDF.

2.3. Determinants of implicit guarantees

To examine the factors that could determine the implicit guarantee granted by a sovereign to a bank, we augment the framework described above with the following elements. Let the country in which the bank operates be populated by a representative agent who, as in Romer (1985), has preferences defined over aggregate consumption C and aggregate deposits D, represented by the utility function $u(C, D)$. The function $u(\cdot, \cdot)$ is increasing in both of its arguments. The bank under consideration, in addition to raising funds from the investors and investing in risky assets, issues deposits amounting to d to the representative agent. When $\omega < \bar{\omega}$ and the bank's assets yield a payoff of 0, the investors can initiate the bankruptcy proceedings, forcing the bank to close doors. In this case, its customers lose access to their deposits.[18] However, if the investors receive a transfer $\alpha\tau(\omega)$ from the government, they refrain from legal action, allowing the bank to remain open. The government of the country is benevolent and can levy lump-sum taxes on the representative agent. Thus, a transfer amounting to $\alpha\tau(\omega)$ to keep the bank operating, which is required to prevent customers from losing their deposits, is optimal if

$$u\left(C(\omega) - \alpha\tau(\omega), D\right) \geq u\left(C(\omega), D - d\right). \tag{7}$$

In words, the government provides the transfer if the utility loss due to the reduction in the aggregate amount of deposits available to the representative agent that would take place if the bank were to close doors is larger than the utility loss attributable to the lump-sum taxes that reduce consumption. Note that the representative agent is assumed not to benefit from the transfer directly, which is the case if their only significant claim on the bank consists of deposits.

Due to the fact that $u(\cdot, \cdot)$ is increasing in each of its arguments, the highest transfer the government is willing to provide to the investors, $\alpha\tau^*(\omega)$ satisfies

$$u\left(C(\omega) - \alpha\tau^*(\omega), D\right) = u\left(C(\omega), D - d\right). \tag{8}$$

We interpret $\alpha\tau^*(\omega)$ as the implicit support of the bank by the government.

[18] Banks' total deposits comprise both uninsured deposits and insured deposits, i.e. deposits guaranteed up to some threshold via deposit-insurance schemes that are in place in the countries examined in our empirical analysis. Even if these deposit-insurance schemes were fully credible (riskless), the impact of the loss of uninsured deposits in the case of bankruptcy of a bank is of first-order importance for the national economy. For example, for the largest US commercial banks, uninsured deposits represent more than half of their total deposits, and cross-sectional variations in total deposits are driven largely by changes in uninsured deposits (Egan et al., 2017). Thus, even in the presence of a deposit-insurance scheme, and regardless of the degree of risk associated with it, total deposits provide a meaningful empirical measure of the loss inflicted on the national economy by the failure of the bank.

For the purposes of examining the determinants of $\tau^*(\omega)$, we need to make some assumptions about $u(\cdot, \cdot)$. Feenstra (1986) and Croushore (1993), in studying the microfoundations of the money-in-the-utility-function model, find that relatively weak assumptions imply restrictions about second partial derivatives of the utility function with real balances as the second argument. Using these restrictions in our formulation with deposits in the utility function, we obtain the following result.

Lemma 3 *If $u_{cc} \leq 0$, $u_{dd} \leq 0$ and $u_{cd} \geq 0$, then $\tau^*(\omega)$ is increasing in $C(\omega)$ and in d/D.*

The fact that the implicit support of the bank $\alpha\tau^*(\omega)$ varies positively with aggregate consumption is intuitive. Due to decreasing marginal utility of consumption, the higher is the level of consumption, the lower is the utility cost of funding the transfer to the investors. The positive dependence of $\alpha\tau^*(\omega)$ on $C(\omega)$ shows that the support optimally chosen by the government is procyclical.

Implicit support varying positively with d/D arises from two effects. First, the larger are the deposits of the bank, the higher is the utility cost of letting it close doors. Second, due to the decreasing marginal utility of deposits, the higher is the level of aggregate deposits in the economy, the smaller is the utility gain from keeping the bank open. Consequently, banks whose deposits represent a larger share of the aggregate deposits benefit from stronger implicit supports. Therefore, for a given $C(\omega)$, d/D determines the willingness of the government to support the bank, i.e. the strength of the guarantee.

To illustrate how the riskiness of the sovereign shapes that of the implicit support, it is useful to consider a functional form for the utility function. Namely, we assume that the representative agent's preferences can be represented by the function $u(C, D) = C^\gamma D^{1-\gamma}$, considered in the analysis of Poterba and Rotemberg (1986). For this functional form, which satisfies the restrictions in Lemma 3, one immediately obtains

$$\alpha\tau^*(\omega) = \left[1 - \left(1 - \frac{d}{D}\right)^{\frac{1-\gamma}{\gamma}}\right] C(\omega). \tag{9}$$

Thus, in this case, the implicit support of the bank, for a given level of aggregate deposits, is a linear function of aggregate consumption. Note that with this functional form both the bank-specific strength of the guarantee α and the component that is common to all banks guaranteed by the same government are unambiguously defined. Namely, $\alpha = 1 - \left(1 - \frac{d}{D}\right)^{\frac{1-\gamma}{\gamma}}$ and $\tau^*(\omega) = C(\omega)$. In our empirical analysis, we employ the expression for α to construct a measure of the strength of implicit support. This measure is a function of the relative size of banks' deposits as we interpret banks with a larger deposit base as those that are more important for the national economy, and hence more likely to benefit from strong government guarantees. In contrast, the too-big-to-fail literature focuses on absolute bank size to capture a bank's systemic importance at the global level.

Given that aggregate consumption also represents the tax base in this framework, it is natural to interpret an increase in the volatility of C as an increase in the riskiness of the sovereign. This interpretation is also consistent with Jeanneret (2015), showing that the volatility of the fundamentals is a key determinant of sovereign risk.[19] For these reasons, we maintain that the riskiness of an implicit guarantee is increasing in the riskiness of the sovereign granting it, allowing us to translate Corollary 1 to a testable prediction, stated in what follows.

2.4. Testable predictions

Let us conclude the theoretical analysis by translating some of the results to empirically testable predictions. While the framework is rich enough to deliver multiple predictions, we focus on the predictions that lend themselves most readily to empirical investigation and, at the same time, have not been previously evaluated. For this reason, for instance, we do not study the effects of the guarantees on bank risk taking as such, which are the focus of several recent papers (see, e.g., Brandao-Marques et al., 2018). Instead, we concentrate on the direct effects of government guarantees on bank risk premiums, which is the most novel aspect of our theoretical analysis. Yet, the theory suggests that to isolate such direct effects, we need to control for the presence of the indirect effects. Therefore, empirically we should consider a cross section of banks with similar riskiness, i.e. same level of risk taking. In this way, any resulting differences in risk premiums in the cross section of banks can be attributed solely to direct effects of government guarantees.

Based on Proposition 2, we formulate the following prediction:

Prediction 1: Among banks of similar riskiness, bank risk premiums can either increase or decrease with the strength of the implicit guarantee that they benefit from.

This prediction is important as the previous literature suggests that stronger guarantees are always associated with lower risk premiums.

With regard to the riskiness of implicit support, from Corollary 1 and the discussion on the determinants of implicit guarantees, we obtain the following additional prediction:

Prediction 2: Among banks of similar riskiness, those that are guaranteed by riskier sovereigns should offer higher risk premiums.

[19] Similarly, Hilscher and Nosbusch (2010) find that sovereign credit spreads depend to a significant extent on the volatility of fundamentals. This finding is analogous to the strong link between corporate bond yield spreads and asset volatility, as proposed by Merton (1974), and empirically shown by Campbell and Taksler (2003).

Next, we turn to testing the above two predictions arising from the theoretical framework by applying suitable portfolio-sort techniques; in essence, we evaluate the risk premiums associated with the direct effects of government guarantees, and study the risks reflected in these premiums.

3. Data and empirical strategy

This section describes the sample selection criteria, the asset return data, the sorting techniques used to construct the portfolios, and the econometric methods employed. We also provide some descriptive statistics.

3.1. Sample selection

Our goal is to test the predictions implied by the theoretical framework on data for bank debt and equity returns. We use CDS contracts, rather than corporate bonds, to examine the impact of the guarantees on the cost of bank debt. CDS contracts are standardized, with the terms set by the International Swaps and Derivatives Association (ISDA). While CDS spreads largely reflect the credit risk of the underlying entity, corporate bond yield spreads are often affected by microstructure, tax and illiquidity effects (Elton et al., 2001; Berndt and Obreja, 2010). Therefore, CDS-implied returns can be easily computed and compared across banks of different countries.

We use five-year CDS contracts with modified restructuring clause for senior unsecured debt. For European banks, we use the Euro-denominated contracts, whereas for the remaining banks we use the USD-denominated contracts. As a result, we use the most liquid CDS contracts. The CDS data are obtained from Credit Market Analytics (CMA) through S&P Capital IQ, covering daily mid quotes for the period from January 2004 to November 2018.[20] The starting date is dictated by the low liquidity of the CDS contracts before that date.

We select those entities that S&P Capital IQ categorizes as banks, regardless of whether a bank is a subsidiary or a parent company, and for which CDS contracts are available. We restrict the analysis to developed countries' banks. Although CDS contracts are generally written on larger banks, we filter out those banks with assets in place less than 10 USD

[20]S&P Capital IQ was formed in 2010 from offerings previously provided by Capital IQ, which is also used in academic research mainly for balance-sheet data for corporations (see, e.g., Kahle and Stulz, 2013). On 29 June 2012, S&P Capital IQ acquired CMA Limited from the CMA group. CMA provides independent data concerning the over-the-counter markets, being one of the major providers of CDS quotes, along with Markit. CMA data seem to lead the price discovery process in comparison with the quotes provided by other providers (Mayordomo et al., 2014). Also note that while for sovereigns some data suppliers provide CDS quotes in different currencies, this is not the case for banks.

billion. In this way, we organize our empirical analysis around a group of reasonably large banks, following, for example, Beltratti and Stulz (2012), who identify large banks as those with assets in excess of \$50 billion, thus via an even more restrictive filter. In total, our sample contains 88 banks. The banks' names, along with their available assets, are given in the Internet Appendix (Table A1). We also collect equity prices for the selected banks from S&P Capital IQ. Although many banks have publicly traded equity but no CDS contracts, the opposite can also happen for some banks. This fact slightly limits the sample of banks for which both equity prices and CDS contracts are available.

3.2. Equity and CDS returns

Equity returns are computed simply as the daily log-difference of the total return price index. By contrast, there is no time series data on actual transaction prices for a specific CDS contract (Berndt and Obreja, 2010). Indeed, default swap contracts with constant maturity are reported at market spreads. It is standard to translate the spread on a newly issued CDS into a one-day return. To do this, we follow, among others, He et al. (2017). Let us denote by $CDS_i(t,T)$ the annualized spread at day t of a CDS contract written on bank i and maturing in T years; then, the one-day return of a short CDS strategy (in the case of no default) is given by

$$r_i(t,T) = CDS_i(t\text{-}1,T)/252 - \Delta CDS_i(t,T) \times RD_i(t\text{-}1,T), \tag{10}$$

where $CDS_i(t\text{-}1,T)/252$ is the *carry* component, i.e. the seller's daily receipt of the insurance premium component, and $\Delta CDS_i(t,T) \times RD_i(t\text{-}1,T)$ is the *capital gain* component, which results from being long a defaultable bond and short a risk-free bond. The lagged *risky duration*, $RD_i(t\text{-}1,T)$, is constructed by interacting the default-free discount curve, implied in US Treasury yields up to the five-year maturity (data are from Gürkaynak et al., 2007), with the bank default survival probabilities implied in the daily 5-year CDS spreads. Precisely, to extract survival probabilities, we assume a flat term structure of survival probabilities and a loss given default of 50% (see Appendix I in the Internet Appendix).[21]

Table A3 in the Internet Appendix reports asset return summary statistics; we show the annualized daily asset return statistics for the average bank, along with those for the 25th, 50th and 75th percentiles for the panel of banks, for the 2004-2018 period. Panel

[21] As a caveat, if the CDS spreads include an (il)liquidity component, capturing both liquidity risk and risk premiums, this will be reflected in somewhat lower extracted risk-neutral survival probabilities, which would lower the capital-gain component, and consequently increase the CDS returns. Such an effect is, however, partly attenuated by the fact that we focus on the most liquid contract, i.e. the 5-year CDS (see, e.g., Li and Zinna, 2017).

A presents the statistics for equity returns, while Panel B for CDS returns. During the full sample period, the average equity return is -4% per annum. However, while over the pre-crisis period the average stock return was 20% per annum, over the 2007-18 period it fell substantially, mainly because of the losses that materialized during the 2008-09 global financial crisis. Bank stock returns display little autocorrelation, high standard deviations and high kurtosis, thus being fat tailed. The cross-sectional distribution of bank stock returns seems to be fairly symmetric, being only marginally left skewed.

Turning to CDS returns, it is apparent that their daily variation is substantially smaller than that of equities. Therefore, it emerges that movements in CDS spreads actually result in small CDS returns when compared to equities; in fact, equity returns display a standard deviation that is roughly ten times higher than that of CDS returns. Of particular interest is also that CDS returns show almost no variation prior to the onset of the sub-prime crisis (see, e.g., Eichengreen et al., 2012). Compared with equities, CDS returns are also somewhat more autocorrelated.

3.3. Portfolio construction

We examine the predictions of the theoretical framework by resorting to equally-weighted portfolios of bank asset returns. In doing so, we can average out idiosyncratic components of bank returns and focus only on their systematic risk (Cochrane, 2009). Specifically, to examine whether the EGS commands a risk premium, we need to group banks according to their EGS. However, given that the theoretical analysis suggests that bank-specific risk – captured in the model by the variable p – should be controlled for, we first sort banks on different measures of their riskiness.

3.3.1. First sorts by bank risk

In our theoretical framework, the variable p captures bank-specific risk that stems from the risk taking behavior of the bank. Empirically, however, measuring bank specific risk is not trivial, and there is no single measure that can capture its full complexity. We therefore attempt to capture bank risk by using three commonly used measures. A natural way to proceed is to use accounting ratios; these ratios are widely used by practitioners and academics, given that they are easy to compute and generally available for all banks (Iannotta et al., 2013). First, we use leverage, calculated as the ratio of total assets and equity, both at book value. An advantage of using book values is that there is no clear reason to expect them to have a relation with expected returns (Gandhi and Lustig, 2015). Our measure of leverage is essentially the inverse of the capital ratio, which in turn determines the resilience of the bank to withstand adverse shocks. Second, we use deposits to total assets (another standard accounting ratio) to capture the part of bank risk that is associated with the bank business model, with low deposits to total assets indicating riskier banks. Third, we resort to a market-based measure. Differently from accounting ratios, market-based measures incorporate a number of factors, ranging from the bank's financial and economic conditions to aspects such as management quality, organization, and governance. Specifically, we employ equity volatility, estimated over the three months of daily equity returns prior to the sorting date. Equity volatility provides information complementary to book-value leverage about the default probability of the bank, and is a key input to the Merton model (see, e.g., Acharya et al., 2016).

3.3.2. Second sorts by EGS

We double-sort banks, first by the selected measure of bank risk, as described above, and then by a measure of the EGS. The theoretical framework suggests that the implicit guarantee of a bank should increase with the bank's market share of deposits. Therefore, in line with the theoretical framework, we measure the bank EGS with a proxy for the bank market share of deposits, the bank deposit-to-GDP ratio. Intuitively, banks with high deposit-to-GDP ratios benefit from stronger EGS as the failures of these banks can adversely affect not only the financial system, but also the real economy.

A simple exercise reveals that banks with high deposits to GDP have indeed large exposures to their sovereign, as also suggested by the theoretical framework. Fig. A1 in the Internet Appendix plots bank deposit-to-GDP ratios versus their sovereign exposures in the cross section. The sovereign exposures are estimated by regressing bank CDS returns on sovereign CDS returns. Therefore, these estimates capture the market assessment of bank sovereign exposures, both direct and indirect, which arise from factors including the EGS (Li and Zinna, 2017). We find that for the sample of banks of all countries the correlation coefficient between these two measures is equal to 24%. When restricting the sample of banks to those based in core-EU countries, this correlation coefficient more than doubles to 66%, and is more precisely estimated. This finding is not surprising given that sovereign risk is likely to be more elevated in EU countries. However, for non-EU core banks, the correlation is 27%, suggesting that there is substantial heteroskedasticity across banks located in different EU countries, being stronger for core EU and much weaker for non-core EU banks, especially for the full sample. Generally, the correlations tend to be higher over the pre bail-in sample, when sovereign risk was more elevated. Overall, these findings seem to support the use of deposits to GDP as an appropriate sorting variable for our purposes.

The use of the deposit-to-GDP ratio as proxy for the EGS, and therefore as an appropriate variable to test the theoretical predictions, is motivated by Eq. (9). It is, however, useful to compare this measure with two alternative measures widely used in the literature: the rating uplift (see, e.g., Gropp et al., 2011; Correa et al., 2014; Acharya et al., 2014), and bank size (see, e.g., Gandhi and Lustig, 2015; Acharya et al., 2016). Relative to the rating uplift, the bank-to-deposit ratio is more likely to be exogenous to bank asset returns. Indeed, the rating uplift captures not only the implicit guarantee, i.e. the bank market share of deposits, but also many other factors, including bank risk and the ability of the sovereign to rescue a bank (see, e.g., Schich and Lind, 2012; Li and Zinna, 2017). In fact, we find a positive and strongly statistically significant correlation between rating uplifts and deposit-to-GDP ratios only when controlling for sovereign and bank risk. This evidence lends support to the use of the deposit-to-GDP ratio as suitable sorting measure in a cross-country analysis, not reflecting sovereign risk, being instead a more direct measure of the implicit support. Moreover, unlike the rating uplift, which changes across rating agencies and over time in response to revisions in the methodologies of the rating agencies, the deposit-to-GDP ratio measures EGS consistently over time. Therefore, the deposit-to-GDP ratio is an objective measure, not being contaminated by the judgment of the rating agency.

Turning to bank size, bigger commercial banks also tend to have more deposits, so that bank size and deposits move closely together. What is crucial instead is that our proxy for the EGS measures the importance of the bank for the national economy, rather than its systemic importance at the global level. In fact, standard measures of systemic importance, which largely reflect (absolute) bank size, tend to deliver a substantially different bank ranking than one would obtain using our measure. For instance, Bank of America and Citibank are classified as more globally systemically important than Banco Santander and Unicredit in terms of size. However, when banks are single-sorted by their deposit-to-GDP ratios, the former two are allocated to the low deposit-to-GDP portfolio, whereas the latter two to the high deposit-to-GDP portfolio. This observation also rationalizes why we no longer find a relation between the EGS and sovereign exposures when the deposit-to-GDP ratio is replaced by bank size (or absolute deposits).

Finally, one might argue that deposit-to-GDP ratios capture banks' direct sovereign exposures. However, we find that, using the sovereign debt holdings released by the European Banking Association in the 2011 stress test exercise, while deposit-to-GDP ratios correlate with domestic holdings of sovereign debt over GDP, they do not correlate with the holdings of sovereign debt when standardized by total assets. If anything, smaller banks display higher direct sovereign exposures, as measured by domestic sovereign holdings over total assets. This finding suggests that, despite holdings of domestic sovereign debt potentially being one of the factors determining the level of the implicit support of a bank, these types of sovereign exposures do not correlate with our measure of EGS. Therefore, deposit-to-GDP ratios convey different information than measures of banks' direct sovereign exposures.

3.3.3. Sorting strategy

Fig. 2 illustrates our sorting strategy, which consists of a series of 2×2 sorts. At the beginning of each month, we allocate banks to two portfolios according to the selected measure of bank risk. Then, we further split each of these two portfolios into two subportfolios according to the bank EGSs. As a result, for each measure of bank risk, we obtain four portfolios. The double-sorted portfolios are denoted by LL, LH, HL, HH, where the first letter denotes the level of the first sorting variable (bank risk) and the second letter that of the second sorting variable (EGS). The return differences between portfolios LH and LL, and between HH and HL denote the *low* bank risk and *high* bank risk spread portfolios, respectively. Spread portfolios are self-financed strategies, and represent a long position in high EGS banks and short position in low EGS banks. These portfolios are of particular interest as they contain banks of similar riskiness, i.e. level of risk taking, and therefore isolate the direct effects of the EGS on bank returns. We repeat the analysis separately for bank equity and CDS returns. This sorting strategy yields, for each measure of bank risk, a total of eight double-sorted portfolios and four spread portfolios. Using the three measures of bank risk, we obtain a total of 36 portfolios.

Finally, define r^a_{jt} the time–t return on the double-sorted portfolios for j =LL, LH, HL, HH of asset class a, denoting either equities or CDSs. Then, the excess returns at time t for double-sorted portfolios are given by $rx^a_{jt} = r^a_{jt} - rf_{t-1}$, where rf_{t-1} is the lagged daily risk-free rate, proxied by the daily US 1-month T-Bill rate. Since the spread portfolios are self financed, resulting from long-short strategies, their returns are already excess returns. Before turning to present the empirical results, we briefly present the two-pass method associated with Fama and MacBeth (1973).

3.4. Asset-pricing methods

Under no-arbitrage pricing, risk-adjusted excess returns have zero price and satisfy the basic Euler equation $\mathbb{E}[\varphi_{t+1} rx_{jt+1}] = 0$. A linear SDF in turn implies the *beta pricing model*, $\mathbb{E}[rx_j] = \boldsymbol{\lambda}'\boldsymbol{\beta}_j$, so that portfolio-$j$ expected excess returns depend on factor risk prices ($\boldsymbol{\lambda}$) and risk quantities ($\boldsymbol{\beta}_j$). The objects of interest $\boldsymbol{\lambda}$ and $\boldsymbol{\beta}_j$ can be estimated using a two-pass procedure (Fama and MacBeth, 1973).

The *first pass* is a time-series regression of each portfolio's excess return on the vector of risk factors

$$rx_{jt} = \alpha_j + \mathbf{f}_t \boldsymbol{\beta}_j + e_{it}, \qquad t = 1, \ldots, T, \quad \text{for } j = 1, \ldots, n \tag{11}$$

where $\mathbf{f}_t$ is the vector of risk factors, α_j captures the risk-adjusted average realized returns of portfolio j, and $\boldsymbol{\beta}_j$ is the vector of its corresponding exposures to the risk factors. The *second pass* is a cross-sectional regression of average portfolio excess returns on the estimated *betas*

$$\overline{rx}_j = \widehat{\boldsymbol{\beta}}_j' \boldsymbol{\lambda} + a_j, \qquad \text{for } j = 1, \ldots, n \tag{12}$$

where $\overline{rx}_j = \frac{1}{T}\sum_{t=1}^{T} rx_{jt}$, $\widehat{\boldsymbol{\beta}}_j$ is the OLS estimate of $\boldsymbol{\beta}_j$, and a_j is the cross-sectional pricing error associated with portfolio j.

A few observations are in order. First, it is standard in the literature to proxy expected returns with average realized returns, also in the case of CDS portfolios (e.g., He et al., 2017). Second, while the vector $\boldsymbol{\beta}_j$ can be estimated equation by equation using OLS, we report throughout the analysis GMM VARHAC standard errors to account for potential serial correlation. Third, in the second pass, we impose the restriction that the constant (α_j) is equal to zero. Finally, note that the second-pass regressors $\widehat{\boldsymbol{\beta}}_j$ are generated, so that OLS standard errors would understate the degree of parameter uncertainty. While the point estimates of the factor risk premiums are unaffected by the fact that $\widehat{\boldsymbol{\beta}}_j$ are estimated in the first pass, the use of OLS standard errors would compromise inference about the factor risk premiums. There are three standard ways to take into account the uncertainty around the regressors $\widehat{\boldsymbol{\beta}}_j$: the Shanken (1992) correction for the standard errors, GMM standard errors, and bootstrap methods. We use all three methods to test statistical significance.

4. Empirical results

The empirical results are organized in three parts. Section 4.1 details the steps necessary to estimate the EGS risk premium, and evaluates Prediction 1. Then, we turn to assess Prediction 2, in Section 4.2, by showing how the EGS risk premium varies with sovereign risk. Finally, Section 4.3 offers complementary evidence by investigating the types of risk that underlie the EGS factor.

4.1. The EGS risk premium

The key testable prediction of the theoretical framework in Section 2, Prediction 1, states that, for a given level of bank riskiness, banks that are more exposed to a risky government guarantee can offer an EGS risk premium. We evaluate this prediction using the portfolio sorts and asset-pricing methods described earlier. The test assets include the 36 portfolios formed by double-sorted banks, first by their intrinsic riskiness, using three alternative measures, and then by deposits to GDP, as described in Section 3, for the period from January 2004 to November 2018. Specifically, the test assets consist of 12 double-sorted equity portfolios and the 6 associated EGS spread portfolios, and 12 double-sorted CDS portfolios and the 6 associated EGS spread portfolios. Therefore, the set of dependent variables to be explained includes a broad set of portfolios, which helps mitigate the problems that can arise in the presence of a strong factor structure in test-asset returns (Lewellen et al., 2010). Moreover, the inclusion of the EGS spread portfolios, in addition to the double-sorted portfolios, is instrumental to identify the EGS price of risk in the second-pass regressions, when the pricing factor is itself a return (e.g., Della Corte et al., 2016); we will return to this point later when discussing second-pass regressions.

Table 1 presents the average realized excess returns ($\overline{rx}_j$). We find that double-sorted equity portfolios tend to deliver large negative average excess returns for low deposit-to-GDP banks, and roughly zero average excess returns for high deposit-to-GDP banks. While none of the average returns of the double-sorted portfolios are statistically lower than zero, the EGS spread portfolios, which are the ultimate object of interest, are positive, large and statistically significant, with the only exceptions of those associated with the low leverage and equity volatility portfolios, which are not statistically significant. The low deposit-to-total assets spread portfolio generates the highest return of roughly 11% per annum. The average excess returns for the double-sorted CDS portfolios also tend to be negative, but they are not statistically significant. More importantly, EGS spread portfolios $\overline{rx}_j$ are economically small for CDS markets, which is not surprising in light of the evidence on the return descriptive statistics, and they are also not statistically different from zero.

We test the robustness of the portfolios along two important dimensions. First, we double-sort the banks using the market share of deposits, so that the banks' deposits are standardized by the country deposits, and not by the country GDP. This exercise is subject to the caveats that i) at a practical level, the resulting portfolios are not tradable in real time given that the country deposits are released with a two year lag, and ii) some extrapolation of the data is needed, such as for the UK where the data are only available until 2009 (we simply use the latest data available). Nevertheless, we find that the double-sorted portfolios are essentially unchanged. Second, one might argue that changes in the deposit-to-GDP ratios can be driven by changes in GDPs. This possibility would clearly contaminate the analysis. The reasoning is as follows: as GDP drops, holding fixed the bank deposits, bank deposit-to-GDP ratios would increase, which would translate to an increase in the EGSs for the banks located in that country, and change the allocation of the banks to the portfolios in a potentially counterintuitive manner. To rule out this possibility, we change our EGS sorting variables; specifically, we standardize the bank deposits by the 2003 level of GDP so that the denominator is held constant, and all the variability is driven by changes in the numerator, i.e. bank deposits. The resulting evidence is clear cut, that is, the portfolios are again unchanged. It is also important to note that the portfolios are populated by a similar number of banks, which helps exclude the possibility that a few banks might be driving our findings. In short, our portfolios are robust to these refinements and are not likely to be driven by outliers.

Summing up, the presence of positive equity EGS spread portfolio returns, which are statistically and economically significant, is suggestive that an EGS risk premium might indeed exist, as predicted by the theoretical framework. However, before making more definite conclusions, we need to examine whether the average risk-adjusted returns are also positive and statistically significant. In essence, we need to establish whether such excess returns reflect compensation for risk and hence reflect a risk-return trade-off consistent with the theoretical framework.

4.1.1. Explaining returns with standard risk factors

We start by considering a four-factor SDF (see Table A2 for a detailed definition of the risk factors). The first risk factor is the market factor (*Mkt*), as measured by the daily return on the MSCI World Index in excess of the daily one-month T-bill rate. The second and third risk factors are the bond market (*Term*) and credit spread (*Crd*) differentials. Term is the daily change in the spread between the 10- and 2-year US Treasury rates, which largely measures business-cycle risk. The slope of the term structure is also an important determinant of bank profitability, given banks' maturity transformation activities (Alessandri and Nelson, 2015). Crd is the daily change in the spread between the high-yield and investment-grade US corporate rates, which captures corporate default risk and thus, among other things, the riskiness of bank assets. Finally, we also include the *TED* spread, computed as the daily change in the yield difference between the one-month Libor and the US T-bill of the same maturity. TED measures stress in the interbank market, being strongly related to funding liquidity, which in turn is intertwined with market liquidity (Brunnermeier and Pedersen, 2009). A larger spread points to a diminished willingness of banks to provide funding in the interbank market, as occurred at the peak of the global financial crisis (Brunnermeier, 2009).

Table 1 presents the first-pass regression estimates. As for the double-sorted portfolio regressions, the risk factors generally enter with the expected signs; indeed, they load positively on Mkt and Term, and negatively on Crd and TED. Thus, as risk increases (declines), bank returns decline (increase). Moreover, Mkt, Term and Crd seem to be key factors in explaining both equity and CDS portfolios, being generally statistically significant at the 1% level, while TED helps explain the returns of some of the CDS portfolios. Taken together, these four factors explain roughly 60% and 30% of the variations in equity and CDS portfolio returns, respectively.

Turning to the regressions of EGS spread portfolios, the findings are clear cut: standard risk factors fail to explain EGS spread portfolio returns, as revealed by the low R^2s and, more importantly, by the statistically and economically significant *alphas*. In essence, the average realized spread returns ($\overline{rx}_j$) are basically the same as the risk-adjusted returns (α_j). As a result, based on this set of risk factors, bank returns sorted by deposits to GDP are an anomaly, as we cannot find evidence that they can be understood as compensation for risk.

4.1.2. Constructing the EGS factor

A natural way to proceed is to examine the factor structure of the risk-adjusted returns (see, e.g., Berndt and Obreja, 2010; Gandhi and Lustig, 2015). Thus, we perform a principal component (PC) analysis of the residuals obtained from the first-pass regressions of the double-sorted portfolio returns on the set of standard risk factors (Table 1). We extract the loadings for the first three principal components, displayed in Fig. 3, which explain roughly 85% of the variation in the residuals.[22]

Of particular interest is that the three PC loadings suggest that the PCs have a clear economic interpretation. The first PC is a bank *level* factor, given that it loads positively on all the portfolios. The second PC is a *security* factor, being short in equity portfolios and long in CDS portfolios.[23] The third PC is a candidate *EGS* factor as it is long in high deposit-to-GDP portfolios and short in low deposit-to-GDP portfolios. Notably, this structure associated with the weights of the third PC holds both for equity and CDS portfolios. Moreover, these factor weights align with the pattern of the equity (risk-adjusted) returns, making the EGS factor as the only likely candidate to be added to the set of risk factors.

Next, as in Gandhi and Lustig (2015), we exploit the PC weights to construct three return

[22]Note that equity risk-adjusted returns display substantially higher variation than CDS risk-adjusted returns. Therefore, we standardize the residuals before executing the PC analysis. Also, we use the residuals from regressions of double-sorted portfolio returns, excluding the spread portfolio returns, to carry out the PC analysis.

[23]One could argue that this finding is consistent with the evidence that equity and bond returns respond differently to capital-market anomalies (Chordia et al., 2017).

factors (Fig. A2 in the Internet Appendix). While the PCs are generated as $PC_{j,t} = \tilde{\boldsymbol{\epsilon}}_t \widehat{\boldsymbol{w}}_j'$, the return factors are constructed as $R[PC_j]_t = \boldsymbol{xr}_t \widehat{\boldsymbol{w}}_j'$, where $\boldsymbol{w}_j$ is the vector of principal component weights associated with the jth PC, and $\tilde{\boldsymbol{\epsilon}}$ are the standardized residuals (risk-adjusted returns). The advantage of working with the return factors rather than with the raw PCs is that they are tradable risk factors. A factor is considered to be tradable if it is a convolution of returns, regardless of whether the loadings, or weights, on the returns are known in real time.[24] A convenient feature of a return factor is that its price of risk must equal its expected return, so that the mean of the factor is its price of risk (e.g., Menkhoff et al., 2012). It follows that if the mean of the return factor is not statistically different from zero, then its price of risk is also zero.

Therefore, we examine the statistical significance of the averages of the return factors presented in the bottom panels of Fig. A2. Our candidate as additional pricing factor is the EGS return factor, $R[PC_3]_t$; thus, we start by examining its mean. We find that it is roughly 11% per annum, with a p-value of around 1%. Therefore, the EGS price of risk is both economically and statistically significant, which seems striking, given that the sample is not only relatively short, but also characterized by severe shocks. By contrast, the level and security factors average around -12% and 12%, respectively, but none of the two is statistically significant, with p-values around 25%.

4.1.3. Explaining returns with the EGS factor

Next, we repeat the first-pass regressions by adding the EGS return factor to the set of risk factors, which results in a five-factor SDF. The main findings, displayed in Table 2, are easy to summarize. We start by noting that the spread portfolios load positively on the EGS return factor, and this holds both for equities and CDSs. This finding, in turn, suggests that an EGS premium is priced consistently in both markets. Not surprisingly, in light of the statistical properties of the returns, the magnitudes of such EGS loadings are substantially higher for equities than for CDSs. Nevertheless, the results for equities are probably of broader interest, given that average risk-adjusted returns for equities are large and statistically significant, based on the standard set of pricing factors (Table 1). By including the EGS return factor in the SDF, the *alphas* on the equity spread portfolios are

[24] The reason is that, while the portfolios need to be tradable in real time, the factor is not needed to form the portfolio strategy. Rather, its purpose is to help us understand the risk-return trade-off that can explain the excess returns arising from the portfolio strategy in terms of compensation for risk. In the asset-pricing literature, a non-tradable or non-return factor is generally converted to a tradable-return factor using factor-mimicking portfolios. This conversion is implemented by running OLS regressions, using full sample information, of the original non-tradable factor on a set of returns. The loadings obtained from such regressions are then used to construct the factor-mimicking portfolio, by projecting the non-tradable factor onto the space of returns (e.g., see Breeden et al., 1989; Ang et al., 2006; Menkhoff et al., 2012; Adrian et al., 2014).

no longer large in economic terms, and their statistical significance also drops.[25] Moreover, the R^2s on the spread portfolios jump, on average, from roughly 5% to 75%, ranging from a minimum of 45% to a maximum of 90%.

For the equity regressions, the positive loadings of the spread portfolios on the EGS return factor result from the combination of the negative loadings of the low deposit-to-GDP portfolios and the positive loadings of the high deposit-to-GDP portfolios. By contrast, for the CDS regressions, high deposit-to-GDP portfolios have larger EGS exposures than the low deposit-to-GDP portfolios, but low deposit-to-GDP portfolios at times also display positive exposures.[26] To shed further light on this issue, in the Internet Appendix (Table A4), we repeat the first-pass regressions by replacing $R[PC_3]_t$ with $PC_{3,t}$. Indeed, by doing so, we find that low deposit-to-GDP CDS portfolios show negative exposures to the EGS PC factor, and the R^2s on the CDS spread portfolios are substantially higher, reaching a maximum of 17%. However, this exercise also shows one of the major shortcomings of working with a factor that is not tradable and also has zero mean by construction: the *alphas* remain economically large and statistically significant.

Finally, we note that the estimated *betas* are generally individually significant, regardless of whether standard-system OLS, GMM-based, or bootstrap procedures are used to compute standard errors. For brevity, we only report GMM-based standard errors for the first-pass regressions. Most importantly, a statistically significant spread in the *betas* across portfolios is a necessary condition to find a spread in the expected returns across portfolios. In formulae, the expected return associated with factor k for portfolio j is given by $\beta_{jk}\lambda_k$. We test whether $\beta_{jk} = 0$ and $\beta_{jk} = \beta_j \ \forall j$, for each factor $k =$Term, TED, Crd, Mkt and R[PC$_3$]. As Table A5 shows, we can strongly reject both hypotheses.[27] Next, we turn to the cross-sectional analysis (second-pass regressions).

[25] The *alphas* on the low deposit-to-total assets and on the high equity-volatility equity spread portfolios are no longer statistically significant. Moreover, for the remaining four equity spread portfolios, the *alphas* display less statistical and economic significance than the respective average excess returns.

[26] This finding is likely to result from the following two facts. First, by construction, while the PC weights are extracted from risk-adjusted returns, the EGS return factor, differently from the associated PC, is not necessarily independent from the other risk factors; see also the discussion in Gandhi and Lustig (2014) on this issue. Second, despite us performing the PC analysis on the *standardized* risk-adjusted portfolio returns to account for the different variation of equity and CDS returns, we still find that the weights on the third PC are larger (in absolute terms) for equities than for CDSs. This finding, coupled with the fact that we use the return factor rather than the PC as risk factor, explains why the return factor largely reflects the information embedded in the equity portfolios.

[27] Although the *betas* on TED are often individually not significant, we show in the Internet Appendix (Table A5) that they contribute somewhat to the spread in expected returns, in particular when both double-sorted and spread portfolios are considered. We therefore opt to include TED in the SDF, but the results are robust to excluding it.

4.1.4. Cross-sectional asset pricing

The spread in the factor *betas* is not a sufficient condition to conclude that there is a spread in the factor excess returns across portfolios, as it also depends on whether the pricing factor commands a statistically (and economically) significant price of risk.[28] Table 3 presents the cross-sectional asset-pricing results. Starting from Panel B.I, which is our main object of interest, we find a strongly statistically and economically significant positive price of risk associated with the EGS return factor. Statistically, the price of risk is precisely estimated according to all three procedures employed to compute standard errors. The bootstrapped p-value, which is our preferred statistic given the relatively short sample and the presence of severe shocks that make returns fat tailed, is below 5%. Economically, the price of risk for a unit exposure to the EGS factor is as high as 12% per annum. The point estimate is very close to the average of the EGS return factor, and we cannot reject the null that the two are equal.

We now turn to assess the economic significance in terms of portfolio excess returns, thus interacting the portfolio *betas* with the price of risk. This exercise delivers equity excess returns, associated with the EGS factor, which range across the spread portfolios from a minimum of 5% to a maximum of 9% per annum. The absolute magnitudes of the CDS excess returns are clearly much smaller, being on average around 0.15% per annum, but relative to CDS returns, these premiums are not negligible.[29]

We employ three measures to evaluate the cross-sectional fit. First, we uncover a good fit in terms of explained variation: the R^2 is 94%. Second, we cannot reject the null that the pricing errors are zero. Third, the MAE is 0.93% per annum. However, to better evaluate the contribution of the EGS return factor to the model fit, we compare these statistics with those obtained from the model containing only the other risk factors (Panel A.I), thus excluding the EGS factor. It is evident that the inclusion of the EGS factor helps very much improve the model fit. When the EGS factor is excluded, the R^2 drops by 20 percentage points, and the MAE doubles; the difference in MAEs, 0.97, is statistically significant, based on the 95% confidence interval, obtained by bootstrap. The evidence is less clear cut when

[28] When the factor is tradable, one knows its excess return and hence its price of risk. Thus, one can infer the risk premium associated with that factor from the first-pass regressions. But, when the factor is not tradable, or the SDF includes a combination of tradable and non-tradable factors – as in our case – then it is necessary to proceed with the cross-sectional analysis to infer the factor prices of risk. That said, regardless of whether the factor is tradable or not, it is useful to conduct the cross-sectional analysis since it allows us to perform tests on the model cross-sectional pricing errors, thus providing additional information about the ability of the factors to price the cross section of assets.

[29] When we perform the second-pass regression by replacing $R[PC_3]_t$ with $PC_{3,t}$ (Table A6), we find that the EGS risk premium priced in the CDS market is higher, being on average across portfolios around 0.45% per annum. This finding is likely due to the more precise estimates of the CDS spread portfolios' exposures to the EGS factor.

looking at the pricing error test, given that the test fails to reject the null of zero pricing errors also in the model without the EGS factor.[30]

Although it is not the main focus of the analysis, we briefly comment on the prices of risk associated with the other risk factors. It is apparent that they are not precisely estimated, which is particularly evident when using the bootstrap procedure; the only price of risk with a p-value below 10% is that associated with the credit factor (Crd). However, the only prices of risk with economically meaningful signs, being therefore consistent with a risk-return explanation, are those associated with TED and the market factor, although these effects are economically negligible. These findings largely hold also when the EGS return factor is excluded from the SDF.

Before proceeding further, let us briefly return to the differences between equity and CDS excess returns. Our theoretical framework does not allow us to explain why risk premiums for equities should be much larger than for CDSs, as it focuses on a portfolio comprising both equity and debt, rather than providing separate expressions for the risk premiums of these two claims. However, we conjecture that the observed differences in excess returns ($\overline{rx}$) between equity and CDS spread portfolios, evident in Table 1, could arise as a consequence of the priority of debt over equity, implying that the government guarantee will differentially affect these two claims in different states of the world. Specifically, the fact that debt holders are paid before equity holders implies that in the states of the world in which the guarantee is particularly low, the entire transfer from the government goes to debt holders. Given that in these states the insurance provided by the guarantee is likely to be valued the most, the risk premium of a debt claim is unlikely to be substantially increased by the guarantee. We provide a more formal illustration of how this mechanism could operate in the Internet Appendix (Section II), where we solve for the risk premium of debt and equity claims separately, in a simplified framework that abstracts from risk taking.

4.1.5. Bail-in regime

In the summer of 2013, EU members reached an agreement on the adoption of the bail-in regulation. This new regulation is intended to shield taxpayers from bank bailouts, and help break the tight nexus between troubled banks and heavily indebted governments. Rating agencies initially reacted to this new regulation by reducing some of the bank rating uplifts. However, how the new measures affected market participants' perceptions of too-big-to-fail subsidies is not obvious. The academic literature on this topic is yet at its infancy. A notable

[30]The weaker evidence likely reflects the low power of this particular test in our context, as it is inconsistent with the other evidence in the table. The above evidence suggests that the EGS factor enters the SDF significantly, and contributes considerably to the pricing power of the SDF in terms of R^2 and reduction in the magnitude of the pricing errors.

exception though is the study by Schäfer et al. (2016), which shows that actual bail-ins led to stronger market reactions than the implementation of resolution regimes. Therefore, the authors conclude that actions speak louder than words.

Our empirical strategy offers a privileged perspective to infer the market reaction to this regime change, due to the following reason: in a credible and effective bail-in regime, banks' implicit guarantees should be significantly reduced if not eliminated, and we would no longer expect high deposit-to-GDP banks to benefit from stronger implicit guarantees. As a result, when a bail-in regime is fully operational and credible, we should no longer find an EGS risk premium in bank asset returns. But the fact that the new regulation fully came into effect only in 2016, along with the uncertainty around its implementation, might have limited the impact on bail-out expectations. For these reasons, an EGS risk premium could still exist. It is therefore natural to ask to what extent market participants have reacted to the agreement on the new bail-in regime.

To address this question, we repeat the analysis by excluding the years after the adoption of the new bail-in regulation. Panel A.II and B.II in Table 3 present the cross-sectional estimates for the model without and with EGS factor, respectively, for the period from January 2004 to June 2013. We indeed find that the EGS risk premium was substantially larger in the years prior to the bail-in regime; in fact, the market price of risk associated with the EGS factor is economically larger (17% versus 12%). Also note that the *alphas* on the equity spread portfolios are no longer statistically significant when the first-pass regressions are performed over the 2004-2013 period (Table A7 in the Internet Appendix).

Visual inspection of Fig. 4 also shows that the cumulative return of the EGS factor is essentially zero over the bail-in period. However, it is also apparent that the EGS factor drops substantially soon after the agreement on the new regime, before stabilizing somewhat. This evidence seems to suggest that the agreement on the bail-in regime, despite not yet being fully operational, led market participants to reassess this aspect of the bank-sovereign nexus. However, around the end of 2015, the EGS factor resumes its rise. The turning point is around the time four EU lenders were rescued. Thus, a possible interpretation is that this episode led market participants to reassess the credibility of the bank resolution regime (Philippon and Salord, 2017).[31] Moreover, around the same time, the rating uplift starts

[31] The rescues of the four European banks could have affected the credibility of the new regime in line with the findings in Schäfer et al. (2016). It is also worth bearing in mind that the bail-in regime has been phased in before the completion of other critical measures of the banking union in the EU (Philippon and Salord, 2017). Furthermore, bailouts will still be required in extreme systemic events (Avgouelas and Goodhart, 2014). Having said that, the new regime seems to be producing significant changes under a number of dimensions (Philippon and Salord, 2017). Our findings, taken together, accord with a bail-in regime that has produced some changes (in the EGS factor), but it is deemed to be not yet fully credible and effective. Of course, this evidence, and the associated interpretation, need to be taken with a note of caution, as they are based on a transition period from the old regime to the new one, which is not complete, as noted before.

increasing again (see Fig. A4 in the Internet Appendix), which suggests that also the rating agencies might have changed their initial assessment. This evidence, albeit preliminary, suggests that a bail-in regime can help attenuate the bank-sovereign nexus.

4.1.6. Equity only analysis: 2000-2018

So far, we have presented the joint analysis of equity and CDS portfolios for the 2004-2018 period. The sample length is largely dictated by the availability of sufficiently liquid bank CDSs. However, by using only data for equities we can extend the sample span back in time. We therefore repeat the analysis using only equity portfolios over the 2000-2018 period. We use January 2000 as cut-off date, given that Capital IQ balance-sheet data are sufficiently comprehensive since then. That said, as the subsequent analysis will show, there is probably not much scope in trying to extend the sample further back in the past.

As before, to construct the equity portfolios, we double sort banks by the three measures of bank risk, and then on deposits to GDP. Next, we perform the first-pass regressions on the four standard risk factors (Panel A of Table 4). We find that these factors fail to explain the equity spread portfolios returns; their *alphas* are positive and statistically significant, and the R^2s are low. We report the PC analysis of the risk-adjusted returns in Fig. A3, in the Internet Appendix; it shows that the second PC weights are positive for the high deposit-to-GDP portfolios and negative for the low deposit-to-GDP portfolios. Therefore, this time, we construct the EGS return factor using the weights associated with the second PC. The resulting factor resembles the behavior of the previously estimated EGS factor. Most importantly, there is no evidence of an EGS premium in the years prior to the unfolding of the sub-prime crisis. This evidence well accords with the time series of the rating uplift presented in Fig. A4: indeed, the median uplift for the sample of developed countries over the 2000-2007 period was zero. Possibly due to this reason, during this period there was no risk-return trade-off associated with government guarantees. A plausible explanation is that investors during these "good times" simply neglected this type of risk (see, e.g., Gennaioli et al. (2015) on neglected risks). Such behavior could have been motivated by the fact that, even though there were cases of bank bailouts, sovereign risk was judged to be, unlike in recent years, negligible in developed countries. Thus, government guarantees were likely not considered to be risky to any meaningful degree.

The first-pass estimates of the EGS exposures are very similar to those obtained for the 2004-2018 sample. However, we find that, when the EGS factor is constructed by using only equity portfolios, none of the *alphas* is statistically different from zero (Panel B of Table 4). Moreover, the estimate of the price of EGS risk, albeit somewhat smaller, is still economically large and strongly statistically significant (Table 5), and is larger when the bail-in period is excluded from the analysis.

Overall, the results based on the longer sample using only equities are similar to those obtained for the 2004–2018 period. Of particular interest is that this additional analysis confirms that the EGS premium is largely generated in the period between the onset of the sub-prime crisis and the agreement of EU members on the adoption of the bail-in regulation.

4.1.7. Robustness to additional risk factors

The four-factor benchmark SDF specification used in our empirical analysis includes factors that are often used in the literature to jointly price the cross section of stock and bond returns. For example, the use of Term and Crd dates back at least to the seminal paper of Fama and French (1993). However, this SDF omits some of the factors that are generally used to price equity portfolios, most notably the Fama-French factors SMB, HML and MOM. We therefore test the robustness of the findings by augmenting the benchmark SDF specification, that is, by including the global versions of these three factors, given that our analysis is based on an international sample of banks. As a result, the standard SDF now includes seven pricing risk factors.

This alternative SDF clearly better captures risks in the equity market. In fact, in the first-pass regressions (Table A8 in the Internet Appendix), R^2s increase (on average) across equity double-sorted portfolios by 7 percentage points, while the increase for CDS portfolios is only around 2 percentage points, relative to the four-factor benchmark SDF (Table 1). However, we find that also this seven-factor SDF is unable to explain spread portfolio returns: for the equity and CDS spread portfolios, R^2s increase only by 2 and 1 percentage points, respectively. Thus, also based on this richer SDF specification, there seems to be a puzzle in bank asset returns.

Moreover, the analysis of the risk-adjusted residuals shows that an EGS factor still exists, as the $PC_{3,t}$ loadings maintain the same structure uncovered in our baseline results, being positive for high deposit-to-GDP banks, and negative for low deposit-to-GDP banks (Fig. A5 in the Internet Appendix). It is also evident that the resulting EGS factor does not present material differences from the EGS factor used in the baseline analysis. We then repeat the first-pass regressions by including the EGS factor and find that only one of the alphas in the equity spread portfolios remains weakly statistically significant, although it is not economically significant, dropping from 10% to 2%. Also the results based on the second-pass regressions are largely unchanged: the EGS price of risk is around 13% over the full sample (Table A10 in the Internet Appendix). Overall, we conclude that our findings are robust when expanding the set of risk factors used in the SDF specification.

4.1.8. Summing up

The main prediction of our theoretical framework – Prediction 1 – is strongly supported by the data. Using standard portfolio-sort techniques, where banks are sorted by the EGS, proxied by deposit-to-GDP ratios, we find a statistically and economically significant risk premium, consistent with the direct effects of government guarantees. Moreover, this premium seems to be largely generated in the pre-bail-in period, which is also consistent with the theoretical predictions: such premium compensates investors for the uncertainty about government bailouts, which is eliminated under a credible bail-in regime. In essence, we find empirical evidence in support of the presence of a risk-return trade-off induced by the presence of government guarantees.

We now turn to assessing Prediction 2 from our theoretical framework, which states that the EGS risk premium is increasing in the riskiness of the sovereign granting the support. In what follows, we first examine the EGS risk premium for subgroups of banks that differ in the credit risk of the domestic sovereign. In Section 4.3, we will further examine Prediction 2 by investigating the types of risks that underlie the EGS factor.

4.2. The EGS premium and sovereign risk

Next, we examine how the EGS risk premium differs across two subsamples of countries, which we term *core EU* (including the five largest EU countries) and *safe-haven* countries (the United States, Japan, Germany, and Switzerland). These subsamples are of particular interest: while sovereign risk was a major concern in the EU, it was contained in safe-haven countries. By doing this, we aim to provide evidence on the validity of Prediction 2, which states that the EGS risk premium, ceteris paribus, should be higher in more vulnerable countries.

Starting with core EU, we construct the double-sorted and spread portfolios, by following the same steps as before. We then perform the first-pass regressions by using the 5-factor SDF. However, we do not generate again the EGS factor, instead we use the EGS factor constructed using the whole sample of developed country banks. Table 6 presents the results of the first-pass regressions. The results are qualitatively in line with those of Table 2 for the full sample. However, it is evident that the R^2s are substantially lower, along with the EGS exposures being smaller in absolute value, especially those of the spread portfolios. This finding is, however, not surprising given that the EGS return factor was generated for the sample of developed country banks, while we try to explain with such factor core EU bank portfolios. Also, as a result of this finding, in the second-pass regressions, reported in Table 7, we uncover a larger EGS price of risk, which indeed compensates for the smaller estimates of the quantity of risk. We also find that the price of risk is more precisely estimated for the sample of core EU banks; in addition, most of the findings uncovered for the sample of developed country banks are still present in this restricted sample.

Given that in this section our final object of interest is the excess return associated with the EGS factor, we are not particularly interested in its decomposition into price and quantity of risk components but rather in its magnitude. In this regard, we find that the excess return associated with the EGS factor ranges from a minimum of 12% to a maximum of 19% per annum for core EU banks. These figures are substantially higher than those uncovered for the full sample, suggesting that where sovereign risk is particularly high, the EGS risk premium is indeed higher. However, to further evaluate this argument, we repeat the analysis for the banks based in safe-haven countries. Table 8 reports the estimates from the second-pass regressions; the price of risk is not statistically different from zero.

We subject the analysis to a number of robustness tests, three of which are worth mentioning. First, we repeat the analysis by generating the EGS factor for the specific sample at hand, i.e. separately for the core EU and safe-haven samples. Considering the sample of core EU banks, we first construct the *core EU* EGS return factor, and we then use this factor in the first- and second-pass regressions; these regressions are reported, respectively, in Tables A12–A13 in the Internet Appendix. We find that, while five out of six equity portfolios have positive, large and statistically significant average returns, none of the *alpha*s is statistically different from zero. Moreover, the estimated exposures to the core EU EGS factor ($R[PC_3^{EU}]_t$) are now substantially higher than those estimated using the EGS factor ($R[PC_3]_t$), being of similar magnitudes to those reported in Table 2. As a result, also the estimate of the price of risk is more in line with that of Table 3. Moreover, the EGS equity risk premium is in the range of 8-17% per annum, and the EGS CDS risk premium in the range of 0.35-0.75% per annum (which reflects larger and more precisely estimated CDS spread portfolios' exposures to the EGS factor, when replacing $R[PC_3]_t$ with $R[PC_3^{EU}]_t$.) We follow the same steps for the safe-haven sample, i.e. we generate a *safe-haven* EGS factor that we then use to perform the two-pass analysis, and again find no EGS risk premium (not reported). Second, we find similar results when we replace core EU with the EU sample. Third, we drop Germany from the sample of safe-haven countries, given that it is also included in the core EU sample, and the results are unchanged. Finally, we repeat the analysis at the country level, and find that core EU countries load positively on the EGS factor, while the US has a negative loading (Fig. A6), possibly reflecting its special status in international financial markets. Moreover, focusing on the Eurozone, we show that banks of countries where sovereign risk is more elevated, such as Italy and Spain, display larger EGS loadings than banks of countries where sovereign risk is more contained, such as France and Germany.[32] Therefore, also this complementary evidence is broadly in line with Prediction 2.

4.3. Which risks does the EGS factor reflect?

To gain further evidence on Prediction 2, and to refine our understanding of the EGS risk premium, we explore the risk profile of the EGS return factor using three separate methods. First, we provide a descriptive analysis of the EGS return factor, focusing on key economic and policy events of the 2004-2018 period. Second, we assess the relation between the EGS return factor and sovereign risk, as well as that with economic policy uncertainty and VIX. Third, we use simple regressions to shed light on the risks spanning the EGS return factor, and how they differ from those spanning the level and security return factors; here, we also shed some light on the economic relevance of the direct effect of the guarantee on bank risk premiums relative to that of the indirect effect. Taken together, the results show that the risk-return trade-off associated with government guarantees largely stems from the exposure of the factor to sovereign risk and policy uncertainty, lending further support to Prediction 2.

4.3.1. The EGS factor over time

Fig. 4 plots the cumulative returns on the EGS factor along with major policy and economic events. The period under scrutiny ranges from January 2004 to November 2018. We can clearly identify five distinct phases. The *first phase* covers the pre-crisis period, when there is no evidence of an EGS premium. The *second phase* coincides with the onset and consequent worsening of the sub-prime crisis. During this period, the EGS factor trends upward, experiencing only few drops, and gains roughly 60% over the period.

The EGS factor inverts its trend when the crisis enters a far more turbulent phase, turning into the global financial crisis, which marks the start of the *third phase*. The downward trend of the EGS intensifies with Lehman Brothers' bankruptcy. Soon after, following the introduction of system-wide packages to rescue banks, the EGS factor increases sharply. However, the increase in the EGS factor proves to be short lived, with the factor losing roughly 50% within the next few weeks. This pattern can be explained by the sovereign-bank loop shown in Acharya et al. (2014): system-wide guarantees weaken the fiscal position

[32]A similar ordering holds for the equity and CDS portfolios. However, the UK displays particularly high equity EGS exposure, while the CDS EGS exposure is slightly negative.

of sovereigns, which in turn makes such guarantees risky. The introduction of guarantees in September 2008, despite providing temporary relief to the financial sector, also cast serious doubts on the capability of the US government to manage the crisis (Mishkin, 2011).

As the tensions diminish, the EGS return factor resumes its upward trend. However, it stops its rise as the global financial crisis becomes a sovereign debt crisis. Thus, during the *fourth phase*, the focus shifts from the US to the Eurozone's public finances.[33] Finally, the *fifth phase* covers the period that follows the adoption of the bail-in regulation. As explained in Section 4.1.3, the turning point of the EGS factor around the end of 2015 coincides with the rescues of four European lenders, which cast doubt on the credibility of the bail-in regime (Philippon and Salord, 2017).

4.3.2. Sovereign risk, economic policy uncertainty, and VIX

We complement the above descriptive analysis with another simple analysis of the relation between the EGS return factor and sovereign risk. Specifically, we allocate the observations of the EGS return factor into four buckets, depending on the distribution of the innovations to sovereign risk. We measure sovereign risk with the median of the developed country sovereign 5-year CDS spreads. We then take the first differences of this measure to compute its innovations; this is our conditioning variable. The first bucket contains the 25% of the EGS return factor observations that coincide with the lowest realizations of the conditioning variable (reductions in sovereign risk); the fourth bucket contains the 25% of observations with the highest realizations of the conditioning variable (increases in sovereign risk). We then compute, for each bucket, the average of the EGS factor returns. The results are shown in the top panel of Fig. 5, with the bars denoting the annualized mean returns of the EGS factor for the selected bucket.

As can be seen from the figure, high deposit-to-GDP banks outperform low deposit-to-GDP banks when sovereign risk drops, and vice versa. Thus, the EGS factor decreases monotonically when moving from the low to the high sovereign risk buckets. While this analysis is intentionally simple, it illustrates a clear relation between returns associated with the EGS factor and innovations to sovereign risk. This finding therefore lends strong support to the predictions of the theoretical framework, consistent with a risk-return trade-

[33] The first rescue package for Greece, which soon after is followed by the introduction of the European Financial Stability Facility, leads to increases in the EGS factor. The introduction of the European Stability Mechanism seems to produce a similar effect. However, as the fears that the Eurozone debt crisis is spiraling out of control take hold, i.e. when Spain and Italy become the main source of concern, the EGS factor falls. Around the second rescue package for Greece, the EGS factor again trends upward. This rise stops with Draghi's 'Whatever it takes speech', but it soon after resumes its trend with the introduction of the Outright Monetary Transactions (OMT), which halts the rise in sovereign risk and reduces uncertainty. OMTs are an insurance device against redenomination risk, in the sense of reducing the probability attached to such worst-case scenarios (Cœuré, 2013).

off story, making EGS banks comove negatively with changes in sovereign risk.

Although sovereign risk should be a prominent source of risk for high EGS banks, the theoretical framework also suggests that EGS banks might be exposed to periods of economic policy uncertainty (EPU), which might not necessarily coincide with periods of increased sovereign risk. We therefore replace sovereign risk with the daily US EPU index of Baker et al. (2016). It is apparent that the EGS factor drops when there are marked increases in policy uncertainty. This finding provides complementary evidence in support of the theoretical framework.

Finally, it is interesting to explore the relation between the EGS factor and the VIX index. The VIX represents a measure of the market's risk-neutral expectation of stock market volatility over the next 30 day period. The VIX is often referred to as the fear index, measuring tail risk or systemic risk, along with investors' risk aversion, which might result, for example, from episodes of risk panics in the financial sector (see, e.g., Bacchetta et al., 2012). Thus, the VIX reflects episodes of financial market turmoil, which do not stem necessarily from surges in sovereign risk or economic policy uncertainty. Interestingly, Baker et al. (2016) show that, despite the VIX and the EPU index being correlated at low frequencies, the EPU index provides additional explanatory power for firms in sectors with high government exposures. More fundamentally, government guarantees should protect banks from surges in the VIX, thus reducing the tail risk of banks (Gandhi and Lustig, 2015). Consistent with this view, we find that the EGS factor increases for positive innovations to VIX, and vice versa; the relation is monotonic.

Taken together, these pieces of evidence align nicely with the predictions of the theoretical framework: government bailouts protect banks from surges in tail risk, which directly pertain to the financial sector, but at the same time expose high EGS banks to sovereign risk and the uncertainty associated with economic policy. Put differently, if the guarantees were to protect banks from tail risk, without exposing them to sovereign risk and policy uncertainty, then government bailouts would reduce the risk premiums of high EGS banks. This conclusion essentially reflects the main mechanism in Gandhi and Lustig (2015) that might indeed be appropriate for US banks, given that in the US sovereign risk is low. This effect is also likely to have been operating at the onset of the financial crisis, when the financial sector was in turmoil, but sovereigns did not yet take on the credit risk of banks, by guaranteeing the banking sector.

4.3.3. EGS factor vs level and security factors

To conclude the analysis of the EGS return factor, we compare the risks that span the EGS return factor with those that span the *level* and *security* return factors. To do this, we single sort banks by balance-sheet variables and proxies of the EGS, as well as sovereign risk and sovereign exposure variables. The list of sorting variables is reported in Table A2. We perform a comparison in terms of R^2s, where these single-sorted equity portfolios are used as explanatory variables.

The results are presented in the top panel of Table 9. A number of interesting results emerge from this horse race, which we can summarize as follows. First, the EGS return factor is largely spanned by portfolios sorted by proxies of the government support, such as deposit-to-GDP, size and loan-to-GDP and, to less extent, rating uplift.[34] The high R^2s also suggest that the first sorts on bank risk are not central to our results. Second, and more importantly, portfolios sorted by sovereign risk exposures and sovereign risk also comove with the EGS factor, thus confirming and complementing the previous pieces of evidence. Third, level and security factors are exposed to substantially different sources of risk. Indeed, the bottom panel shows that for these factors sovereign risk and exposures portfolios display no explanatory power.

Although the focus of the study is not on the indirect effects of the guarantees, the following observation is in order. Table 9 shows that the regression of the EGS factor on the spread portfolio constructed by single-sorting banks by the deposit-to-GDP ratio, call it HML^{1S}, yields an R^2 of 91%. This finding seems to suggest that the indirect effects are economically less relevant than the direct effects. To further examine this possibility, we compare HML^{1S} with the mean of the spread portfolios obtained by double sorting banks, first by bank risk and then by deposits to GDP, call it HML^{2S}. We do this exercise by focusing on equities, as this asset class shows an economically significant EGS risk premium. As a result, the cross-sectional mean of the double-sorted spread portfolios consists in averaging over six portfolios. Here, the idea is that, for the indirect effect to be economically negligible, the two spread portfolios should be very similar; by contrast, for the indirect effect to be relevant, the mean of HML^{1S} should be higher than that of HML^{2S}, with their difference being informative about the magnitude of the indirect effect. We find that the mean return of HML^{1S} is 10.2% per annum, whereas that of HML^{2S} is 7.5%. This simple evidence suggests that 7.5% captures the direct effect, and 2.7% the indirect effect.

[34] Leverage at book value also turns out to be important, but it largely reflects the regularity that larger banks tend also to have higher leverage (Gandhi and Lustig, 2015). However, the R^2 associated with size is almost twice as large as that associated with leverage, suggesting that the two reflect somewhat different information. Moreover, the EGS factor loads negatively on a different measure of bank risk, such as bank CDS.

Therefore, this exercise suggests that the indirect effects play a role, but a less important one quantitatively, relative to the direct effects. On the one hand, based on the model, this could be the case as in the presence of risky guarantees the effect through risk taking is more ambiguous. On the other hand, the effect of government support on charter value could also be empirically relevant, in that it is not clear cut that stronger guarantees induce banks to take on more risk (e.g., see Brandao-Marques et al., 2018), which makes the indirect effect of the guarantee weaker.

5. Conclusion

During the recent global financial crisis and, even more so, in the course of the Eurozone debt crisis, sovereign risk emerged as the main challenge to financial stability. Doubts about the ability of sovereigns to manage their debt undermined the perceived soundness of banks in two ways: first, via the bank holdings of sovereign debt, and second, via the dwindling value of the government guarantees. Our focus in this paper is on the second channel.

We develop a simple theoretical framework to show that government guarantees can generate a risk-return trade-off in bank asset returns, separately from their indirect effects operating through the risk taking of banks. On the one hand, government guarantees are beneficial to banks, given that guaranteed claims generate higher payoffs when the guarantee is honored. On the other hand, if guarantees are less likely to be honored when the state of the economy worsens, the payoffs of the guaranteed claims can become more procyclical, thus providing poor insurance when it would be most valuable. Due to the latter effect, government guarantees can have a direct positive effect on bank risk premiums. The theoretical framework yields two testable predictions on the direct effects of guarantees on bank risk premiums. Namely, among banks of similar riskiness, bank risk premiums should (1) vary with the strength of the implicit guarantee, and (2) increase with the riskiness of the sovereign granting it.

We evaluate these predictions empirically using standard asset-pricing methods applied to bank debt and equity portfolios. To construct the portfolios, we double sort banks, first by bank risk and then by the deposit-to-GDP ratio, employed as a measure of the government's willingness to support a bank. Both predictions are supported by the empirical analysis. First and most fundamentally, we uncover a risk premium associated with expected government support. While this premium is priced consistently in both markets, it is substantially higher in equity than in CDS returns. Second, this risk premium is intimately tied to sovereign risk, meaning that risk premiums on guaranteed banks are, *ceteris paribus*, higher when the guarantor is riskier.

These findings are relevant for asset managers given that the portfolio strategies are tradable in real time, but they also bear important policy implications. First, they help inform the design of bank guarantees, given that the risk profile of the guarantee ultimately determines to what extent bank funding costs fall with the introduction of the guarantee. The reason is that funding costs not only reflect the (physical) probability of default of the bank, but they also include a risk premium component. Such premium is likely to be low, and the guarantee effective, when the riskiness of the guarantor and the uncertainty associated with the guarantee are low. Second, we show, consistent with our theoretical framework, that the EGS premium is essentially zero since the adoption of the bail-in regulation in the EU. More generally, this evidence supports the view that such reforms, to the extent that they are credible, can reduce investors' expectations of government support for banks, thereby weakening the link between sovereigns and banks.

Appendix A. Proofs

Before presenting the proofs, we summarize the notation employed.

Object	Definition
ω	State of the world.
$F(\cdot)$	Objective probability distribution function of ω.
$G(\cdot)$	Risk-neutral probability distribution function of ω.
a	Level of effort exerted by the managers.
p	$1 - G(\bar{\omega})$, where $\bar{\omega}$ is chosen by the managers.
$(-\ln p)a^{\beta}$	Realized payoff when $\omega \geq \bar{\omega}$, where $\beta < 1$.
π_b	Payoff of the managers.
π_l	Payoff of the investors.
$\alpha\tau(\omega)$	Transfer obtained by the investors when $\omega < \bar{\omega}$.
$\bar{R}$	Risk-free rate.
R_l	Return of the investor's claim on the bank.
$\int_{-\infty}^{\bar{\omega}} \tau(\omega)\mathrm{d}F(\omega) / \int_{-\infty}^{\bar{\omega}} \tau(\omega)\mathrm{d}G(\omega)$	Risk premium of the guarantee.

Proof of Lemma 1. Following Bester and Hellwig (1987), we first solve the managers' problem for given π_b and π_l. That is,

$$\max_{\{a,p\}} p\left[(-\ln p)a^{\beta} - \pi_l\right] - a \qquad \text{subject to} \qquad \pi_b + \pi_l + (\ln p)a^{\beta} = 0. \tag{A.1}$$

Denoting by λ the Lagrange multiplier associated with the constraint, the necessary first-order conditions for a solution are

$$\beta p(-\ln p)a^{\beta-1} - 1 + \lambda\beta(\ln p)a^{\beta-1} = 0 \tag{A.2}$$

$$(-\ln p)a^{\beta} - \pi_l - a^{\beta} + \lambda\frac{a^{\beta}}{p} = 0. \tag{A.3}$$

Solving Eq. (A.2) for λ and substituting the solution into Eq. (A.3) yields

$$\pi_l = (-\ln p)a^{\beta} - \frac{a}{\beta p(-\ln p)}. \tag{A.4}$$

When this condition holds, the managers' expected payoff is positive as long as

$$-\ln p \leq \frac{1}{\beta}. \tag{A.5}$$

Conditions in Eqs. (A.4) and (A.5) are identical in form to those in Bester and Hellwig (1987). However, here p denotes a risk-neutral rather than an objective probability. Due to the similarity, we refer to Bester and Hellwig (1987) for a proof that Eqs. (A.4) and (A.5) are sufficient as well as necessary for a solution to the managers' problem.

Using Eq. (A.4) to substitute for π_l in Eq. (3) yields the following problem

$$\max_{\{a,p\}} \alpha \int_{-\infty}^{\bar{\omega}} \tau(\omega)\mathrm{d}G(\omega) + p(-\ln p)a^{\beta} - \frac{a}{\beta(-\ln p)} - I, \tag{A.6}$$

subject to Eq. (A.5). Note that in this reformulated problem the investors directly choose a and p. Supposing that the constraint does not bind, we obtain the following necessary first-order conditions

$$\beta p(-\ln p)a^{\beta-1} - \frac{1}{\beta(-\ln p)} = 0 \tag{A.7}$$

$$-\alpha\tau(\bar{\omega}) - (\ln p + 1)a^{\beta} - \frac{a}{\beta p(-\ln p)^2} = 0. \tag{A.8}$$

Employing Eq. (A.7) to solve for a and substituting the solution into Eq. (A.8) yields

$$-\ln p = 1 + \beta + \frac{\alpha\tau(\bar{\omega})}{[\beta^2 p(-\ln p)^2]^{\frac{\beta}{1-\beta}}}. \tag{A.9}$$

For β and $\tau(\bar{\omega})$ sufficiently small, $-\ln p$ satisfies Eq. (A.5) with strict inequality. Given that this is the solution we are interested in, we restrict attention to such values of β and $\alpha\tau(\bar{\omega})$. In particular, β is required to satisfy $1 + \beta < \frac{1}{\beta}$.

To conclude the proof, we show how p varies with α. Implicitly differentiating Eq. (A.9) with respect to α yields

$$-\frac{1}{p}\left[\beta^2(-\ln p)^2\right]^{\frac{\beta}{1-\beta}}\left[1 + (-\ln p - 1 - \beta)\frac{\beta}{1-\beta}\left(\frac{2}{-\ln p} - 1\right)\right]\frac{\mathrm{d}p}{\mathrm{d}\alpha} = \tau(\bar{\omega}). \tag{A.10}$$

The expression in square brackets is positive whenever

$$(1+\beta)^2(-\ln p) - \beta(-\ln p)^2 - 2\beta(1+\beta) > 0. \tag{A.11}$$

It is straightforward to verify that Eq. (A.11) holds for $1 + \beta < -\ln p < \frac{1}{\beta}$ and $1 + \beta < \frac{1}{\beta}$. Given that we are restricting attention to such values of β and $\tau(\bar{\omega})$ for which this condition is satisfied, we have shown that $\frac{\mathrm{d}p}{\mathrm{d}\alpha} < 0$. ■

Proof of Lemma 2. Combining Eqs. (A.4) and (A.7) to solve for π_l as a function of p yields

$$\pi_l = (1-\beta)(-\ln p)\left[\beta^2 p(-\ln p)^2\right]^{\frac{\beta}{1-\beta}}. \tag{A.12}$$

By differentiating with respect to p one obtains

$$\begin{aligned}\frac{\mathrm{d}\pi_l}{\mathrm{d}p} =& -\frac{1-\beta}{p}\left[\beta^2 p(-\ln p)^2\right]^{\frac{\beta}{1-\beta}} \\ & + \beta(-\ln p)\beta^2\left[(-\ln p)^2 - 2(-\ln p)\right]\left[\beta^2 p(-\ln p)^2\right]^{\frac{2\beta-1}{1-\beta}}.\end{aligned} \tag{A.13}$$

By simplifying one observes that this expression is negative whenever

$$-(1-\beta) + \beta\left[(-\ln p) - 2\right] < 0. \tag{A.14}$$

This inequality is equivalent to $-\ln p < \frac{1+\beta}{\beta}$. Given that we require p to satisfy $-\ln p < \frac{1}{\beta}$ this condition is always satisfied. Thus, we have shown that $\frac{\mathrm{d}\pi_l}{\mathrm{d}p} < 0$. ■

Proof of Proposition 1. Differentiating Eq. (5) with respect to α yields

$$\begin{aligned}\frac{\mathrm{d}}{\mathrm{d}\alpha}\left\{\mathbb{E}[R_l] - \bar{R}\right\} =& \frac{-\tau\pi_l\left[G(\bar{\omega}) - F(\bar{\omega})\right]\bar{R}}{\left\{\alpha\tau G(\bar{\omega}) + \pi_l\left[1 - G(\bar{\omega})\right]\right\}^2} \\ & + \frac{\alpha\tau\left[G(\bar{\omega}) - F(\bar{\omega})\right]\bar{R}}{\left\{\alpha\tau G(\bar{\omega}) + \pi_l\left[1 - G(\bar{\omega})\right]\right\}^2}\frac{\mathrm{d}\pi_l}{\mathrm{d}\alpha} \\ & + \frac{\partial}{\partial\bar{\omega}}\left\{\mathbb{E}[R_l] - \bar{R}\right\}\frac{\mathrm{d}\bar{\omega}}{\mathrm{d}\alpha}.\end{aligned} \tag{A.15}$$

The first term is negative by inspection. We will refer to it as the direct effect of the guarantee on the risk premium. In the second term, $\frac{\mathrm{d}\pi_l}{\mathrm{d}\alpha} = \frac{\mathrm{d}\pi_l}{\mathrm{d}p}\frac{\mathrm{d}p}{\mathrm{d}\alpha} > 0$ by Lemmas 1 and 2. Thus, this term is positive. In the third term, $\frac{\mathrm{d}\bar{\omega}}{\mathrm{d}\alpha} = -\frac{1}{G'(\bar{\omega})}\frac{\mathrm{d}p}{\mathrm{d}\alpha} > 0$. The partial derivative in the third term, on the other hand, is equal to

$$\begin{aligned}(\pi_l - \alpha\tau)\Big\{&\left[G'(\bar{\omega}) - F'(\bar{\omega})\right]\left\{\alpha\tau G(\bar{\omega}) + \pi_l\left[1 - G(\bar{\omega})\right]\right\} \\ +G'(\bar{\omega})(\pi_l - \alpha\tau)&\left[G(\bar{\omega}) - F(\bar{\omega})\right]\Big\}\bar{R}\Big/\left\{\alpha\tau G(\bar{\omega}) + \pi_l\left[1 - G(\bar{\omega})\right]\right\}^2.\end{aligned} \tag{A.16}$$

A sufficient condition for this term to be positive is $G'(\bar{\omega}) \geq F'(\bar{\omega})$. To complete the proof, note that if $\alpha = 0$ and $G'(\bar{\omega})\left[1 - F(\bar{\omega})\right] = F'(\bar{\omega})\left[1 - F(\bar{\omega})\right]$ only the first, negative term in Eq. (A.15) remains. Thus, in this case the derivate is negative. On the other hand, if $F(\bar{\omega}) = G(\bar{\omega})$ and $G'(\bar{\omega}) \geq F'(\bar{\omega})$ only the third, positive term remains. Therefore, in this case the derivate is positive. ■

Proof of Proposition 2. Differentiating Eq. (6) with respect to α yields

$$\begin{aligned}
&\frac{\mathrm{d}}{\mathrm{d}\alpha}\left\{\mathbb{E}[R_l]-\bar{R}\right\} \\
=&\frac{\int_{-\infty}^{\bar{\omega}}\tau(\omega)\mathrm{d}F(\omega)\left\{\alpha\int_{-\infty}^{\bar{\omega}}\tau(\omega)\mathrm{d}G(\omega)+\pi_l\left[1-G(\bar{\omega})\right]\right\}}{\left\{\alpha\int_{-\infty}^{\bar{\omega}}\tau(\omega)\mathrm{d}G(\omega)+\pi_l\left[1-G(\bar{\omega})\right]\right\}^2} \\
&-\frac{\int_{-\infty}^{\bar{\omega}}\tau(\omega)\mathrm{d}G(\omega)\left\{\alpha\int_{-\infty}^{\bar{\omega}}\tau(\omega)\mathrm{d}F(\omega)+\pi_l\left[1-F(\bar{\omega})\right]\right\}}{\left\{\alpha\int_{-\infty}^{\bar{\omega}}\tau(\omega)\mathrm{d}G(\omega)+\pi_l\left[1-G(\bar{\omega})\right]\right\}^2} \\
&+\left\{\frac{\left[1-F(\bar{\omega})\right]\alpha\int_{-\infty}^{\bar{\omega}}\tau(\omega)\mathrm{d}G(\omega)}{\left\{\alpha\int_{-\infty}^{\bar{\omega}}\tau(\omega)\mathrm{d}G(\omega)+\pi_l\left[1-G(\bar{\omega})\right]\right\}^2}\right. \\
&\left.-\frac{\left[1-G(\bar{\omega})\right]\alpha\int_{-\infty}^{\bar{\omega}}\tau(\omega)\mathrm{d}F(\omega)}{\left\{\alpha\int_{-\infty}^{\bar{\omega}}\tau(\omega)\mathrm{d}G(\omega)+\pi_l\left[1-G(\bar{\omega})\right]\right\}^2}\right\}\frac{\mathrm{d}\pi_l}{\mathrm{d}\alpha} \\
&+\left\{\frac{G'(\bar{\omega})\left[\pi_l-\alpha\tau(\bar{\omega})\right]\left\{\alpha\int_{-\infty}^{\bar{\omega}}\tau(\omega)\mathrm{d}F(\omega)+\pi_l\left[1-F(\bar{\omega})\right]\right\}}{\left\{\alpha\int_{-\infty}^{\bar{\omega}}\tau(\omega)\mathrm{d}G(\omega)+\pi_l\left[1-G(\bar{\omega})\right]\right\}^2}\right. \\
&\left.-\frac{F'(\bar{\omega})\left[\pi_l-\alpha\tau(\bar{\omega})\right]\left\{\alpha\int_{-\infty}^{\bar{\omega}}\tau(\omega)\mathrm{d}G(\omega)+\pi_l\left[1-G(\bar{\omega})\right]\right\}}{\left\{\alpha\int_{-\infty}^{\bar{\omega}}\tau(\omega)\mathrm{d}G(\omega)+\pi_l\left[1-G(\bar{\omega})\right]\right\}^2}\right\}\frac{\mathrm{d}\bar{\omega}}{\mathrm{d}\alpha}.
\end{aligned} \tag{A.17}$$

The first two terms represent the direct effect of the guarantee on the risk premium, whereas the remaining terms capture the effects that operate through risk taking. The direct effect is positive if and only if

$$\frac{\int_{-\infty}^{\bar{\omega}}\tau(\omega)\mathrm{d}F(\omega)}{\int_{-\infty}^{\bar{\omega}}\tau(\omega)\mathrm{d}G(\omega)}\geq\frac{1-F(\bar{\omega})}{1-G(\bar{\omega})}. \tag{A.18}$$

That is, if and only if the risk premium of the guarantee exceeds the risk premium of the underlying unguaranteed claim, $\mathbb{1}_{\{\omega\geq\bar{\omega}\}}\pi_l$. Note that, in the case of a constant guarantee, the ratio on the left-hand side becomes $F(\bar{\omega})/G(\bar{\omega})\leq 1$ by stochastic dominance. For this reason, Eq. (A.18) does not hold and the direct effect is negative. To show that also the total effect is ambiguous, consider the following two cases. First, suppose that Eq. (A.18) does not hold, $\alpha=0$ and $G'(\bar{\omega})\left[1-F(\bar{\omega})\right]=F'(\bar{\omega})\left[1-F(\bar{\omega})\right]$. In this case, the direct effect is negative and the effect operating through risk taking is zero. Second, suppose that Eq. (A.18) is satisfied with equality and $G'(\bar{\omega})\geq F'(\bar{\omega})$. In this case, the first four terms of Eq. (A.18) sum to zero while the last two terms sum to a positive expression. Therefore, also the total effect is ambiguous. ■

Proof of Corollary 1. Abstracting from risk taking, the effect of an increase in α is given by the first two terms in Eq. (A.17). Their sum is positive only if the guarantee commands a higher risk premium than the underlying unguaranteed claim. ■

Table 1: First-pass equity and CDS regressions

This table presents the first-pass time-series regressions of equity and CDS double-sorted portfolio excess returns (LL, HL, HL, HH) and the spread portfolios returns (L H/L and H H/L) on the risk factors. Banks are first sorted on bank risk (low, high), and then on deposits to GDP (low, high), our proxy for the expected government support. For a given measure of bank risk, spread portfolios are given by LH-LL for low bank risk, and HH-HL for high bank risk. We use three measures of bank risk: bank book leverage (Leverage), equity volatility (EQ Vol.) estimated over three-month rolling windows, and deposits to total assets (Dep2TA), which moves in opposite direction to bank risk. Portfolios are rebalanced at a monthly frequency. The resulting double-sorted and spread portfolios are regressed on standard risk factors ($\mathbf{f}_t$), such as $rx_{it} = a_i + \mathbf{f}_t\boldsymbol{\beta}_i' + \epsilon_{it}$, where i is the selected portfolio. The $\mathbf{f}_t$ vector includes changes in Term, changes in TED, changes in Credit (Crd), and MSCI world stock market excess returns (Mkt). $\overline{rx}_i$ is the mean excess return of portfolio i. The sample covers all banks and spans the period from 01/2004 to 11/2018 at a daily frequency. Adjusted R^2s are in percent. ***,**,* denote significance, respectively, at the 1-, 5- and 10-percent levels, based on GMM-VARHAC standard errors.

	Panel A: EQUITY Returns						Panel B: CDS Returns					
	Leverage (L)			Leverage (H)			Leverage (L)			Leverage (H)		
	L	H	H/L	L	H	H/L	L	H	H/L	L	H	H/L
$\overline{rx}_i$	-4.50	-1.96	2.54	-9.42	-1.25	8.17**	-0.47	-0.59	-0.12	-0.25	-0.61	-0.37
con	-10.07**	-6.77	3.31	-14.53***	-6.19	8.34***	-0.68	-0.72	-0.05	-0.41	-0.76	-0.35
Term	3.32	6.33***	3.01	5.16**	5.60***	0.44	1.39***	1.10***	-0.29	1.18***	1.00***	-0.18
TED	0.99	-1.29	-2.28	0.06	-1.45	-1.51	-0.69**	-0.40	0.30	-0.75**	-0.37	0.38***
Crd	1.09	-6.95***	-8.05***	-3.21***	-7.53***	-4.31***	-1.17***	-1.44***	-0.27***	-1.37***	-1.30***	0.07
Mkt	1.50***	1.35***	-0.16**	1.41***	1.37***	-0.04	0.08***	0.05***	-0.03***	0.06***	0.05***	-0.01*
R^2	59.78	63.24	5.59	65.61	65.04	3.96	28.98	32.92	3.21	32.87	33.69	1.86
	EQ Vol. (L)			EQ Vol. (H)			EQ Vol. (L)			EQ Vol. (H)		
	L	H	H/L	L	H	H/L	L	H	H/L	L	H	H/L
$\overline{rx}_i$	-4.55	-0.03	4.52	-9.66	-1.33	8.33**	-0.90	-0.82	0.08	-0.38	-0.61	-0.23
con	-8.71**	-4.32	4.39	-14.98***	-6.23	8.74***	-1.04	-0.97**	0.07	-0.58	-0.76	-0.18
Term	4.39***	1.05	-3.34***	4.79**	5.52***	0.72	0.75***	0.28	-0.47*	1.35***	1.01***	-0.34
TED	-0.47	-2.49	-2.02	0.59	-2.03	-2.62	-0.22	-0.37	-0.16	-0.86**	-0.42	0.44***
Crd	-2.16***	-7.64***	-5.49***	-2.20**	-8.30***	-6.10***	-1.07***	-1.15***	-0.07	-1.41***	-1.32***	0.09
Mkt	1.15***	1.12***	-0.03	1.46***	1.36***	-0.10***	0.05***	0.04***	-0.01	0.07***	0.05***	-0.02***
R^2	68.78	62.64	5.58	66.40	63.46	5.61	25.99	30.38	1.04	34.02	33.61	6.25
	Dep2TA (L)			Dep2TA (H)			Dep2TA (L)			Dep2TA (H)		
	L	H	H/L	L	H	H/L	L	H	H/L	L	H	H/L
$\overline{rx}_i$	-12.77	-1.43	11.35***	-10.29	-0.37	9.92**	-0.12	-0.74	-0.61	-0.21	-0.61	-0.40
con	-17.68***	-6.86	10.82***	-15.55***	-5.27	10.27***	-0.29	-0.91	-0.62	-0.37	-0.76	-0.38
Term	9.04***	8.51***	-0.53	5.14**	5.28***	0.15	1.39***	1.02***	-0.37*	1.14***	0.96***	-0.18
TED	-0.79	-1.65	-0.86	0.66	-1.91	-2.57*	-0.83**	-0.30	0.54***	-0.81**	-0.34	0.47***
Crd	-6.01***	-6.68***	-0.66	-2.27**	-8.02***	-5.75***	-1.48***	-1.21***	0.27**	-1.38***	-1.28***	0.10
Mkt	1.42***	1.55***	0.13***	1.45***	1.35***	-0.10**	0.07***	0.06***	-0.00	0.06***	0.05***	-0.01*
R^2	60.11	60.47	1.62	65.81	63.60	4.93	33.59	32.30	2.99	33.82	33.53	2.55

Table 2: First-pass equity and CDS regressions with EGS factor

This table presents the first-pass time-series regressions of equity and CDS double-sorted portfolio excess returns (LL, HL, HL, HH) and the spread portfolios returns (L H/L and H H/L) on the risk factors and the EGS factor. Banks are first sorted on bank risk (low, high), and then on deposits to GDP (low, high), our proxy for the expected government support. For a given measure of bank risk, spread portfolios are given by LH-LL for low bank risk, and HH-HL for high bank risk. We use three measures of bank risk: bank book leverage (Leverage), equity volatility (EQ Vol.), and deposits to total assets (Dep2TA). Portfolios are rebalanced at a monthly frequency. The EGS factor ($R[PC_3]_t = \mathbf{xr}_t\widehat{\mathbf{w}}_3'$) is obtained as the sum of double-sorted portfolio excess returns times the principal component (PC) weights, displayed in the bottom panel of Fig. 3, associated with the third PC obtained from the joint PCA analysis of double-sorted equity and CDS bank portfolios. The EGS factor is long in high deposits-to-GDP (Dep2GDP) banks and short in low Dep2GDP banks. The resulting double-sorted and spread portfolios are regressed on standard risk factors ($\mathbf{f}_t$) and the EGS factor ($R[PC_3]_t$), such as $rx_{it} = \alpha_i + \mathbf{f}_t\beta_i' + \gamma R[PC_3]_t + e_{it}$, where i denotes the selected portfolio. $\overline{rx}_i$ is the mean excess return of portfolio i. The $\mathbf{f}_t$ vector includes changes in Term, changes in TED, changes in Credit (Crd), and MSCI world stock market excess returns (Mkt). The sample covers all banks and spans the period from 01/2004 to 11/2018 at a daily frequency. Adjusted R^2s are in percent. ***,**,* denote significance, respectively, at the 1-, 5- and 10-percent levels, based on GMM-VARHAC standard errors.

	Panel A: EQUITY Returns						Panel B: CDS Returns					
	Leverage (L)			Leverage (H)			Leverage (L)			Leverage (H)		
	L	H	H/L	L	H	H/L	L	H	H/L	L	H	H/L
$\overline{rx}_i$	-4.50	-1.96	2.54	-9.42	-1.25	8.17**	-0.47	-0.59	-0.12	-0.25	-0.61	-0.37
con	-4.22	-9.64**	-5.41**	-12.33***	-9.98**	2.35*	-0.67	-0.88	-0.21	-0.46	-0.90	-0.45
Term	3.24*	6.37***	3.12**	5.13***	5.65***	0.52	1.39***	1.10***	-0.29	1.18***	1.01***	-0.18
TED	-0.65	-0.48	0.17	-0.56	-0.39	0.17	-0.70**	-0.35	0.34	-0.73**	-0.33	0.41***
Crd	-3.29***	-4.80***	-1.51*	-4.86***	-4.68***	0.18	-1.17***	-1.32***	-0.15	-1.33***	-1.19***	0.14
Mkt	1.41***	1.39***	-0.02	1.38***	1.43***	0.05***	0.08***	0.05***	-0.02***	0.06***	0.06***	-0.01
R[PC]	-0.49***	0.24***	0.74***	-0.19***	0.32***	0.51***	-0.00	0.01***	0.01**	0.00	0.01***	0.01**
R^2	74.17	66.89	74.98	67.88	71.35	83.83	28.96	34.32	5.18	32.98	35.01	3.47

	EQ Vol. (L)			EQ Vol. (H)			EQ Vol. (L)			EQ Vol. (H)		
	L	H	H/L	L	H	H/L	L	H	H/L	L	H	H/L
$\overline{rx}_i$	-4.55	-0.03	4.52	-9.66	-1.33	8.33**	-0.90	-0.82	0.08	-0.38	-0.61	-0.23
con	-7.81**	-8.65**	-0.84	-11.95***	-10.60**	1.35	-1.10*	-1.12**	-0.02	-0.62	-0.91	-0.29
Term	4.37***	1.11	-3.27***	4.75***	5.58***	0.82	0.75***	0.28	-0.47*	1.35***	1.01***	-0.34
TED	-0.72	-1.27	-0.55	-0.26	-0.80	-0.54	-0.20	-0.33	-0.13	-0.85**	-0.37	0.48***
Crd	-2.82***	-4.39***	-1.57***	-4.46***	-5.03***	-0.56*	-1.03***	-1.03***	-0.00	-1.38***	-1.20***	0.18*
Mkt	1.14***	1.19***	0.05**	1.41***	1.43***	0.02	0.05***	0.04***	-0.01	0.08***	0.06***	-0.02***
R[PC]	-0.08***	0.37***	0.44***	-0.26***	0.37***	0.63***	0.01**	0.01***	0.01***	0.00	0.01***	0.01**
R^2	69.37	74.02	53.39	70.61	71.56	91.08	26.21	32.51	2.24	34.06	35.00	7.91

	Dep2TA (L)			Dep2TA (H)			Dep2TA (L)			Dep2TA (H)		
	L	H	H/L	L	H	H/L	L	H	H/L	L	H	H/L
$\overline{rx}_i$	-12.77	-1.43	11.35***	-10.29	-0.37	9.92**	-0.12	-0.74	-0.61	-0.21	-0.61	-0.40
con	-16.37***	-11.30**	5.07	-12.47***	-9.66**	2.81**	-0.33	-1.03	-0.69	-0.42	-0.90	-0.47
Term	9.03***	8.57***	-0.46	5.09***	5.34***	0.25	1.39***	1.02***	-0.37*	1.14***	0.96***	-0.18
TED	-1.16	-0.40	0.75	-0.20	-0.68	-0.48	-0.82*	-0.26	0.56***	-0.80**	-0.30	0.49***
Crd	-6.99***	-3.35**	3.64***	-4.57***	-4.74***	-0.16	-1.45***	-1.12***	0.32***	-1.34***	-1.17***	0.17*
Mkt	1.40***	1.62***	0.22***	1.40***	1.42***	0.02*	0.07***	0.06***	-0.00	0.06***	0.06***	-0.01
R[PC]	-0.11***	0.38***	0.49***	-0.26***	0.37***	0.63***	0.00	0.01***	0.01**	0.00	0.01***	0.01*
R^2	60.76	66.97	46.34	70.16	71.89	90.75	33.65	33.02	3.63	33.91	34.75	3.89

Table 3: Second-pass equity and CDS cross-sectional regressions

This table reports results for running the cross-sectional regression $\overline{rx}_i = \boldsymbol{\beta}_i'\boldsymbol{\lambda} + a_i$, where $\overline{rx}_i$ is the mean excess return of portfolio i, and $\widehat{\boldsymbol{\beta}}_i$ is the vector of factor betas associated with portfolio i, resulting from the first-pass regressions (Tables 1 and 2). For the factor prices of risk ($\boldsymbol{\lambda}$), Shanken p-values are in squared brackets, GMM-VARHAC p-values are in braces, and bootstrapped p-values are in angled brackets. We also report the cross-sectional adjusted R^2s, the pricing error test statistics p-values based on GMM-VARHAC (PE Test), along with the mean absolute pricing errors (MAE). ΔMAE denotes the difference between the MAE resulting from the model with EGS factor, and the MAE resulting from the model without EGS factor; statistical significance is tested using the bootstrap replications, whereby ***,**,* denote significance, respectively, at the 1-, 5- and 10-percent levels. Top panels report the results for the model with standard risk factors but without the EGS factor, while bottom panels include the EGS factor in the set of standard risk factors. Left panels show the analysis for the full sample period (01/2004-11/2018), while right panels exclude the bail-in period (01/2004-06/2013). The analysis covers developed country banks' equity and CDS portfolios.

Panel A: Model without EGS Factor

	Panel A.I: Full Sample (2004-18)					Panel A.II: Sample ex Bail-in (2004-13)			
	λ	Shan.	GMM	Boot		λ	Shan.	GMM	Boot
Term	-0.73	[0.062]	{0.135}	<0.139>	Term	-0.72	[0.092]	{0.123}	<0.202>
TED	-4.83	[0.018]	{0.038}	<0.268>	TED	-4.38	[0.029]	{0.045}	<0.390>
Crd	0.79	[0.212]	{0.265}	<0.385>	Crd	0.37	[0.402]	{0.416}	<0.290>
Mkt	-0.56	[0.461]	{0.468}	<0.324>	Mkt	-3.65	[0.318]	{0.334}	<0.227>
	R^2	PE Test	MAE			R^2	PE Test	MAE	
	74.2	0.975	1.89			72.3	0.969	2.71	

Panel B: Model with EGS Factor

	Panel B.I: Full Sample (2004-18)					Panel B.II: Sample ex Bail-in (2004-13)			
	λ	Shan.	GMM	Boot		λ	Shan.	GMM	Boot
Term	-0.40	[0.165]	{0.197}	<0.153>	Term	-0.89	[0.040]	{0.053}	<0.053>
TED	-2.91	[0.028]	{0.054}	<0.114>	TED	-2.92	[0.057]	{0.087}	<0.226>
Crd	1.96	[0.030]	{0.046}	<0.033>	Crd	2.83	[0.057]	{0.076}	<0.094>
Mkt	2.71	[0.311]	{0.323}	<0.329>	Mkt	1.75	[0.411]	{0.417}	<0.471>
R[PC]	11.92	[0.031]	{0.021}	<0.018>	R[PC]	17.33	[0.029]	{0.018}	<0.017>
	R^2	PE Test	MAE	ΔMAE		R^2	PE Test	MAE	ΔMAE
	93.8	0.954	0.926	0.97**		95.0	0.996	0.976	1.73**

Table 4: First-pass equity only regressions: 2000-2018

This table presents the first-pass time-series regressions of equity double-sorted portfolio excess returns (LL, HL, HL, HH) and the spread portfolios returns (L H/L and H H/L) on the risk factors without EGS factor (Panel A) and with EGS factor (Panel B). Banks are first sorted on bank risk (low, high), and then on deposits to GDP (low, high), our proxy for the expected government support. For a given measure of bank risk, spread portfolios are given by LH-LL for low bank risk, and HH-HL for high bank risk. We use three measures of bank risk: bank book leverage (Leverage), equity volatility (EQ Vol.), and deposits to total assets (Dep2TA). Portfolios are rebalanced at a monthly frequency. The EGS factor ($R[PC_2]_t = \mathbf{xr}_t \widehat{\mathbf{w}}_2'$) is obtained as the sum of double-sorted portfolio excess returns times the principal component (PC) weights associated with the third PC obtained from the joint PCA analysis of double-sorted equity and CDS bank portfolios (Fig. A3 in the Internet Appendix). The EGS factor is long in high deposits-to-GDP (Dep2GDP) banks and short in low Dep2GDP banks. The resulting double-sorted and spread portfolios are regressed on standard risk factors ($\mathbf{f}_t$) and the EGS factor ($R[PC_2]_t$), such as $rx_{it} = \alpha_i + \mathbf{f}_t \boldsymbol{\beta}_i + \gamma R[PC_2]_t + e_{it}$, where i denotes the selected portfolio. $\overline{rx}_i$ is the mean excess return of portfolio i. The $\mathbf{f}_t$ vector includes changes in Term, changes in TED, changes in Credit (Crd), and MSCI world stock market excess returns (Mkt). The sample covers all banks and spans the period from 01/2000 to 11/2018 at a daily frequency. Adjusted R^2s are in percent. ***,**,* denote significance, respectively, at the 1-, 5- and 10-percent levels, based on GMM-VARHAC standard errors.

	Panel A: Model without EGS Factor						Panel B: Model with EGS Factor					
	Leverage (L)			Leverage (H)			Leverage (L)			Leverage (H)		
	L	H	H/L	L	H	H/L	L	H	H/L	L	H	H/L
$\overline{rx}_i$	-2.28	0.10	2.38	-6.17	0.44	6.60**	-2.28	0.10	2.38	-6.17	0.44	6.60**
con	-4.49	-1.98	2.51	-8.32**	-1.74	6.58**	0.61	-4.38	-4.99**	-6.29*	-4.81	1.48
Term	4.71**	7.71***	3.01	6.27***	7.26***	1.00	4.86***	7.64***	2.79***	6.33***	7.17***	0.85
TED	0.61	-2.63	-3.24**	-0.89	-2.80	-1.91*	-1.51	-1.63	-0.11	-1.73	-1.52	0.21
Crd	0.73	-4.28***	-5.01***	-1.95***	-4.72***	-2.77***	-1.96***	-3.02***	-1.06***	-3.02***	-3.10***	-0.08
Mkt	1.37***	1.18***	-0.19***	1.28***	1.23***	-0.05	1.19***	1.26***	0.08***	1.21***	1.33***	0.13***
R[PC]	.	.	.	.	.	.	-0.49***	0.23***	0.72***	-0.20***	0.30***	0.49***
R^2	57.30	56.49	4.32	62.67	59.55	2.79	74.28	60.65	76.19	65.79	66.18	85.00

	EQ Vol. (L)			EQ Vol. (H)			EQ Vol. (L)			EQ Vol. (H)		
	L	H	H/L	L	H	H/L	L	H	H/L	L	H	H/L
$\overline{rx}_i$	-2.67	2.06	4.73	-6.21	0.35	6.56*	-2.67	2.06	4.73	-6.21	0.35	6.56*
con	-4.39	0.30	4.69*	-8.42**	-1.83	6.59**	-3.69	-3.22	0.47	-5.81	-5.24	0.57
Term	5.75***	3.42***	-2.33**	6.02***	7.08***	1.06	5.77***	3.31***	-2.45***	6.10***	6.98***	0.88*
TED	-1.56	-3.75**	-2.20*	-0.49	-3.24*	-2.74**	-1.85	-2.28	-0.44	-1.58	-1.81	-0.23
Crd	-1.42***	-4.41***	-2.99***	-1.48***	-5.06***	-3.58***	-1.79***	-2.55***	-0.77***	-2.86***	-3.26***	-0.40**
Mkt	1.01***	0.96***	-0.05**	1.32***	1.22***	-0.10***	0.99***	1.08***	0.09***	1.23***	1.34***	0.11***
R[PC]	.	.	.	.	.	.	-0.07***	0.34***	0.41***	-0.25***	0.33***	0.58***
R^2	62.71	52.73	2.86	64.17	57.89	3.70	63.28	64.99	48.21	69.21	65.84	88.22

	Dep2TA (L)			Dep2TA (H)			Dep2TA (L)			Dep2TA (H)		
	L	H	H/L	L	H	H/L	L	H	H/L	L	H	H/L
$\overline{rx}_i$	-8.80	0.18	8.98**	-6.63	0.78	7.41**	-8.80	0.18	8.98**	-6.63	0.78	7.41**
con	-11.06**	-2.20	8.86**	-8.82**	-1.41	7.41**	-9.63**	-5.82	3.82	-6.10	-4.90	1.20
Term	9.45***	10.01***	0.56	6.36***	6.72***	0.36	9.49***	9.91***	0.41	6.44***	6.62***	0.18
TED	-1.85	-3.21*	-1.35	-0.34	-3.19*	-2.85**	-2.45	-1.70	0.75	-1.47	-1.74	-0.27
Crd	-3.42***	-4.22***	-0.80	-1.42***	-5.04***	-3.62***	-4.18***	-2.32***	1.86***	-2.85***	-3.19***	-0.35**
Mkt	1.32***	1.37***	0.05	1.31***	1.22***	-0.08***	1.27***	1.49***	0.23***	1.21***	1.35***	0.13***
R[PC]	.	.	.	.	.	.	-0.14***	0.35***	0.49***	-0.26***	0.34***	0.60***
R^2	57.92	54.67	0.52	63.14	58.38	3.51	59.19	61.61	48.62	68.59	66.75	89.89

Table 5: Second-pass equity only cross-sectional regressions: 2000-2018

This table reports results for running the cross-sectional regression $\overline{rx}_i = \boldsymbol{\beta}_i' \boldsymbol{\lambda} + a_i$, where $\overline{rx}_i$ is the mean excess equity return of portfolio i, and $\widehat{\boldsymbol{\beta}}_i$ is the vector of factor betas associated with portfolio i, resulting from the first-pass regressions (Table 4). For the factor prices of risk ($\boldsymbol{\lambda}$), Shanken p-values are in squared brackets, GMM-VARHAC p-values are in braces, and bootstrapped p-values are in angled brackets. We also report the cross-sectional adjusted R^2s, the pricing error test statistics p-values based on GMM-VARHAC (PE Test), along with the mean absolute pricing errors (MAE). ΔMAE denotes the difference between the MAE resulting from the model with EGS factor, and the MAE resulting from the model without EGS factor; statistical significance is tested using the bootstrap replications, and ***,**,* denote significance, respectively, at the 1-, 5- and 10-percent levels. Top panels report the results for the model with standard risk factors but without the EGS factor, while bottom panels add the EGS factor to the set of standard risk factors. The analysis covers all banks, but it is restricted to the equity portfolios. Left panels show the analysis for the full sample period (01/2000-11/2018), while right panels exclude the bail-in period (01/2000-06/2013).

Panel A: Model without EGS Factor

	Panel A.I: Full Sample (2000-18)					Panel A.II: Sample ex Bail-in (2000-13)			
	λ	Shan.	GMM	Boot		λ	Shan.	GMM	Boot
Term	-0.58	[0.176]	{0.252}	<0.193>	Term	-0.53	[0.237]	{0.290}	<0.256>
TED	-4.97	[0.062]	{0.118}	<0.239>	TED	-5.09	[0.079]	{0.130}	<0.295>
Crd	2.12	[0.159]	{0.208}	<0.476>	Crd	2.33	[0.219]	{0.264}	<0.386>
Mkt	-1.27	[0.420]	{0.439}	<0.398>	Mkt	-2.97	[0.340]	{0.369}	<0.276>
	R^2	PE Test	MAE			R^2	PE Test	MAE	
	73.5	0.935	1.95			76.2	0.985	2.17	

Panel B: Model with EGS Factor

	Panel B.I: Full Sample (2000-18)					Panel B.II: Sample ex Bail-in (2000-13)			
	λ	Shan.	GMM	Boot		λ	Shan.	GMM	Boot
Term	-0.87	[0.036]	{0.039}	<0.037>	Term	-1.44	[0.018]	{0.027}	<0.034>
TED	0.29	[0.431]	{0.441}	<0.449>	TED	1.24	[0.282]	{0.332}	<0.454>
Crd	1.89	[0.113]	{0.124}	<0.089>	Crd	1.17	[0.293]	{0.307}	<0.212>
Mkt	7.14	[0.119]	{0.156}	<0.114>	Mkt	6.92	[0.194]	{0.244}	<0.231>
R[PC]	10.3	[0.048]	{0.038}	<0.016>	R[PC]	13.13	[0.051]	{0.039}	<0.022>
	R^2	PE Test	MAE	ΔMAE		R^2	PE Test	MAE	ΔMAE
	93.5	0.794	0.95	1.00^{**}		94.7	0.984	1.03	1.13^{**}

Table 6: First-pass equity and CDS regressions with EGS factor: core Europe

This table presents the first-pass time-series regressions of equity and CDS double-sorted portfolio excess returns (LL, HL, HL, HH) and the spread portfolios returns (L H/L and H H/L) on the risk factors and the EGS factor. Banks are first sorted on bank risk (low, high), and then on deposits to GDP (low, high), our proxy for the expected government support. For a given measure of bank risk, spread portfolios are given by LH-LL for low bank risk, and HH-HL for high bank risk. We use three measures of bank risk: bank book leverage (Leverage), equity volatility (EQ Vol.), and deposits to total assets (Dep2TA). Portfolios are rebalanced at a monthly frequency. The EGS factor ($R[PC_3]_t = \mathbf{xr}_t\widehat{\mathbf{w}}_3'$) is obtained as the sum of double-sorted portfolio excess returns times the principal component (PC) weights, displayed in the bottom panel of Fig. 3, associated with the third PC obtained from the joint PCA analysis of double-sorted equity and CDS bank portfolios for the sample of Developed Countries banks. The EGS factor is long in high deposits-to-GDP (Dep2GDP) banks and short in low Dep2GDP banks. The resulting double-sorted and spread portfolios are regressed on standard risk factors ($\mathbf{f}_t$) and the EGS factor ($R[PC_3]_t$), such as $rx_{it} = \alpha_i + \mathbf{f}_t\beta_i' + \gamma R[PC_3]_t + e_{it}$, where i denotes the selected portfolio. $\overline{rx}_i$ is the mean excess return of portfolio i. The $\mathbf{f}_t$ vector includes changes in Term, changes in TED, changes in Credit (Crd), and MSCI world stock market excess returns (Mkt). The sample covers Core EU (DE, FR, IT, ES, GB) banks and spans the period from 01/2004 to 11/2018 at a daily frequency. Adjusted R^2s are in percent. ***,**,* denote significance, respectively, at the 1-, 5- and 10-percent levels, based on GMM-VARHAC standard errors.

	Panel A: EQUITY Returns						Panel B: CDS Returns					
	Leverage (L)			Leverage (H)			Leverage (L)			Leverage (H)		
	L	H	H/L	L	H	H/L	L	H	H/L	L	H	H/L
$\overline{rx}_i$	-14.13	-7.73	6.40	-19.95**	-6.78	13.16***	-0.18	-0.70	-0.52	-0.02	-0.70	-0.68
con	-17.14**	-14.74**	2.40	-23.77***	-15.15***	8.63**	-0.31	-1.06	-0.75	-0.17	-1.04	-0.87
Term	11.57***	9.77***	-1.80	11.08***	9.38***	-1.70	1.94***	2.22***	0.28	1.32***	1.89***	0.57**
TED	-0.20	-1.02	-0.83	0.67	-0.69	-1.35	0.13	-0.22	-0.35	-0.25	-0.27	-0.02
Crd	-7.07***	-5.52***	1.55**	-6.48***	-4.59***	1.89***	-1.63***	-1.58***	0.05	-1.54***	-1.42***	0.12
Mkt	1.26***	1.51***	0.25***	1.36***	1.61***	0.25***	0.06***	0.10***	0.04***	0.05***	0.09***	0.04***
R[PC]	-0.10**	0.16***	0.26***	-0.06*	0.25***	0.31***	0.00	0.01**	0.01*	0.00	0.01**	0.01
R^2	41.12	54.13	17.55	47.78	59.95	25.23	19.81	29.49	4.51	25.30	31.20	7.52
	EQ Vol. (L)			EQ Vol. (H)			EQ Vol. (L)			EQ Vol. (H)		
	L	H	H/L	L	H	H/L	L	H	H/L	L	H	H/L
$\overline{rx}_i$	-13.98*	-4.56	9.43**	-19.84**	-9.06	10.78***	-0.69	-0.64	0.05	-0.27	-0.28	-0.01
con	-18.33***	-11.91**	6.42	-23.99***	-17.18***	6.81*	-0.90	-1.00	-0.10	-0.46	-0.63	-0.17
Term	8.93***	9.20***	0.27	10.07***	10.11***	0.04	1.80***	1.64***	-0.16	2.05***	2.04***	-0.01
TED	-0.73	-1.10	-0.37	0.26	-0.55	-0.81	0.08	-0.17	-0.24	-0.29	-0.26	0.04
Crd	-5.03***	-4.41***	0.62	-6.20***	-5.29***	0.91	-1.53***	-1.33***	0.20	-1.77***	-1.44***	0.32**
Mkt	1.20***	1.44***	0.23***	1.36***	1.63***	0.27***	0.06***	0.09***	0.03***	0.07***	0.10***	0.03***
R[PC]	0.03	0.22***	0.19***	-0.04	0.22***	0.26***	0.01*	0.01**	0.00	0.00	0.01**	0.01
R^2	47.41	60.95	12.68	48.35	58.51	20.45	17.22	31.49	1.71	24.68	31.36	2.39
	Dep2TA (L)			Dep2TA (H)			Dep2TA (L)			Dep2TA (H)		
	L	H	H/L	L	H	H/L	L	H	H/L	L	H	H/L
$\overline{rx}_i$	-21.16**	-6.74	14.42**	-21.73**	-6.54	15.20***	-0.22	-0.58	-0.37	-0.14	-0.49	-0.36
con	-24.87***	-16.34**	8.53	-25.11***	-15.32**	9.79**	-0.39	-0.89	-0.49	-0.30	-0.82	-0.52
Term	12.06***	13.16***	1.10	10.23***	9.95***	-0.27	1.13***	1.94***	0.81***	1.41***	1.81***	0.40
TED	-0.64	0.59	1.22	0.05	0.10	0.05	-0.46	-0.31	0.15	-0.29	-0.27	0.02
Crd	-7.63***	-4.13**	3.50**	-6.90***	-4.30***	2.60**	-1.39***	-1.34***	0.04	-1.57***	-1.39***	0.17
Mkt	1.38***	1.81***	0.43***	1.28***	1.69***	0.40***	0.05***	0.09***	0.03***	0.05***	0.09***	0.04***
R[PC]	-0.08**	0.31***	0.39***	-0.08**	0.26***	0.34***	0.00	0.01**	0.00	0.00	0.01**	0.00
R^2	44.66	57.28	19.11	45.25	59.86	24.96	25.51	30.63	6.44	24.92	31.37	5.93

Table 7: Second-pass equity and CDS cross-sectional regressions: core Europe

This table reports results for running the cross-sectional regression $\overline{rx}_i = \boldsymbol{\beta}_i'\boldsymbol{\lambda} + a_i$, where $\overline{rx}_i$ is the mean excess return of portfolio i, and $\widehat{\boldsymbol{\beta}}_i$ is the vector of factor betas associated with portfolio i, resulting from the first-pass regressions (Table A11, in the Interent Appendix, and Table 6). For the factor prices of risk ($\boldsymbol{\lambda}$), Shanken p-values are in squared brackets, GMM-VARHAC p-values are in braces, and bootstrapped p-values are in angled brackets. We also report the cross-sectional adjusted R^2s, the pricing error test statistics p-values based on GMM-VARHAC (PE Test), along with the mean absolute pricing errors (MAE). ΔMAE denotes the difference between the MAE resulting from the model with EGS factor, and the MAE resulting from the model without EGS factor; statistical significance is tested using the bootstrap replications, and ***,**,* denote significance, respectively, at the 1-, 5- and 10-percent levels. Top panels report the results for the model with standard risk factors but without the EGS factor, while bottom panels include the EGS factor in the set of standard risk factors. Left panels show the analysis for the full sample period (01/2004-11/2018), while right panels exclude the bail-in period (01/2004-06/2013). The analysis covers core EU (DE, FR, IT, ES, GB) banks' equity and CDS portfolios.

Panel A: Model without EGS Factor

	Panel A.I: Full Sample (2004-18)					Panel A.II: Sample ex Bail-in (2004-13)			
	λ	Shan.	GMM	Boot		λ	Shan.	GMM	Boot
Term	-0.09	[0.472]	{0.482}	<0.292>	Term	-2.55	[0.078]	{0.114}	<0.303>
TED	-7.18	[0.016]	{0.045}	<0.237>	TED	-3.49	[0.054]	{0.100}	<0.305>
Crd	3.00	[0.085]	{0.206}	<0.424>	Crd	0.14	[0.476]	{0.481}	<0.432>
Mkt	2.95	[0.392]	{0.422}	<0.425>	Mkt	5.12	[0.309]	{0.344}	<0.367>
	R^2	PE Test	MAE			R^2	PE Test	MAE	
	79.5	1	3.09			68.2	0.999	3.44	

Panel B: Model with EGS Factor

	Panel B.I: Full Sample (2004-18)					Panel B.II: Sample ex Bail-in (2004-13)			
	λ	Shan.	GMM	Boot		λ	Shan.	GMM	Boot
Term	0.82	[0.144]	{0.175}	<0.328>	Term	0.73	[0.206]	{0.228}	<0.374>
TED	-1.12	[0.242]	{0.218}	<0.366>	TED	-0.82	[0.345]	{0.340}	<0.436>
Crd	0.74	[0.240]	{0.268}	<0.444>	Crd	2.31	[0.098]	{0.120}	<0.195>
Mkt	-15.04	[0.022]	{0.032}	<0.037>	Mkt	-16.43	[0.053]	{0.058}	<0.064>
R[PC]	49.53	[0.005]	{0.009}	<0.003>	R[PC]	58.13	[0.024]	{0.033}	<0.013>
	R^2	PE Test	MAE	ΔMAE		R^2	PE Test	MAE	ΔMAE
	97.4	0.972	0.925	2.17^{***}		97.7	1	0.96	2.48^{**}

Table 8: Second-pass equity and CDS cross-sectional regressions: safe havens

This table reports results for running the cross-sectional regression $\overline{rx}_i = \boldsymbol{\beta}_i'\boldsymbol{\lambda} + a_i$, where $\overline{rx}_i$ is the mean excess return of portfolio i, and $\widehat{\boldsymbol{\beta}}_i$ is the vector of factor betas associated with portfolio i, resulting from the first-pass regressions. For the factor prices of risk ($\boldsymbol{\lambda}$), Shanken p-values are in squared brackets, GMM-VARHAC p-values are in braces, and bootstrapped p-values are in angled brackets. We also report the cross-sectional adjusted R^2s, the pricing error test statistics p-values based on GMM-VARHAC (PE Test), along with the mean absolute pricing errors (MAE). ΔMAE denotes the difference between the MAE resulting from the model with EGS factor, and the MAE resulting from the model without EGS factor; statistical significance is tested using the bootstrap replications, whereby ***,**,* denote significance, respectively, at the 1-, 5- and 10-percent levels. Top panels report the results for the model with standard risk factors but without the EGS factor, while bottom panels include the EGS factor in the set of standard risk factors. Left panels show the analysis for the full sample period (01/2004-11/2018), while right panels exclude the bail-in period (01/2004-06/2013). The analysis covers safe-haven (US, CH, DE, JP) banks' equity and CDS portfolios.

Panel A: Model without EGS Factor

	Panel A.I: Full Sample (2004-18)					Panel A.II: Sample ex Bail-in (2004-13)			
	λ	Shan.	GMM	Boot		λ	Shan.	GMM	Boot
Term	-0.33	[0.164]	{0.172}	<0.302>	Term	-0.01	[0.495]	{0.495}	<0.397>
TED	-0.32	[0.326]	{0.327}	<0.371>	TED	1.87	[0.068]	{0.098}	<0.208>
Crd	0.68	[0.154]	{0.144}	<0.160>	Crd	-0.34	[0.402]	{0.395}	<0.427>
Mkt	-3.29	[0.260]	{0.273}	<0.263>	Mkt	-6.34	[0.190]	{0.221}	<0.251>
	R^2	PE Test	MAE			R^2	PE Test	MAE	
	68.4	0.909	1.28			84.8	1	1.14	

Panel B: Model with EGS Factor

	Panel B.I: Full Sample (2004-18)					Panel B.II: Sample ex Bail-in (2004-13)			
	λ	Shan.	GMM	Boot		λ	Shan.	GMM	Boot
Term	-0.36	[0.146]	{0.140}	<0.237>	Term	-0.16	[0.378]	{0.375}	<0.411>
TED	-0.42	[0.267]	{0.258}	<0.325>	TED	1.30	[0.175]	{0.198}	<0.255>
Crd	1.37	[0.116]	{0.136}	<0.152>	Crd	1.16	[0.323]	{0.320}	<0.193>
Mkt	-1.55	[0.399]	{0.413}	<0.401>	Mkt	-3.35	[0.352]	{0.355}	<0.426>
R[PC]	-1.05	[0.457]	{0.459}	<0.487>	R[PC]	0.69	[0.482]	{0.482}	<0.357>
	R^2	PE Test	MAE	ΔMAE		R^2	PE Test	MAE	ΔMAE
	71.7	0.942	1.37	-0.08		87.7	1	1.11	0.03

Table 9: What risks do the R[PC]s reflect?

This table reports results for running the regressions of the three R[PC]s on single-sorted bank equity spread portfolios (hml^{EQ}), $R[PC]_{jt} = a_j + \phi_{jt} hml^{EQ} + u_{jt}$ for $j = 1, 2, 3$. Equity single-sorted portfolios are constructed using balance-sheet and sovereign-risk variables as sorting variables; for a given sorting variable, banks are grouped into a high or low portfolios, then the spread portfolio is simply the high minus low portfolios. $R[PC_j]_t = \mathbf{xr}_t \widehat{\mathbf{w}}'_j$, where $\widehat{\mathbf{w}}_j$ are the principal component weights associated with the j-th PC, and $\mathbf{xr}_t$ are the equity and CDS portfolios' excess returns. Panel A shows the top 10 portfolios ordered in terms of the estimated R^2s. Panel B focuses on single-sorted portfolios constructed in terms of: i) sovereign risk, using domestic sovereign CDSs or sovereign yields as sorting variables; ii) bank sovereign exposures, obtained by regressing bank CDS returns on the domestic sovereign CDS returns, including (SovExp(c)) or not (Sov Exp) the standard risk factors as controls; and, iii) total assets at book value to GDP (TA2GDP(bv)) and the rating uplift (UpLift) as alternative measures of the EGS. The sample includes developed countries' banks. Variables are standardized. The period is 01/2004-11/2018. Adjusted R^2s are in percent. ***,**,* denote significance, respectively, at the 1-, 5- and 10-percent levels, based on the Newey-West approach with optimal lag selection.

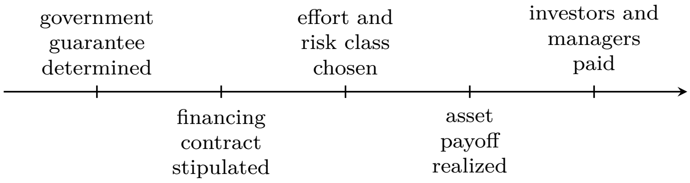
Panel A: Horse Race

$R[PC_1]$			$R[PC_2]$			$R[PC_3]$		
Port.	ϕ	R^2	Port.	ϕ	R^2	Port.	ϕ	R^2
LEV(mv)	0.63***	40.22	EQvol	−0.64***	41.29	Dep2GDP	0.95***	90.84
EQvol	0.63***	39.49	LEV(mv)	−0.63***	39.41	TA2GDP(bv)	0.89***	79.31
PVB	−0.60***	36.47	PVB	0.61***	36.94	Loan2GDP	0.86***	73.86
ROA	−0.53***	27.65	ROA	0.54***	29.06	LEV(bv)	0.63***	39.99
Dep2TA	−0.46***	21.32	Dep2TA	0.45***	20.21	BnkCDS	−0.45***	20.39
BnkCDS	0.43***	18.76	BnkCDS	−0.45***	20.13	Sov.Exp.	0.42***	15.27
ZSCORE	−0.41***	16.82	ZSCORE	0.43***	18.90	SovCDS	0.40***	14.58
TDebt	0.27***	7.28	TDebt	−0.29***	8.45	Sov.Exp(c)	0.41***	14.52
TA2GDP(bv)	0.23***	5.23	CASHR	−0.20***	4.10	SovYld	0.30***	9.15
TA(mv)	0.19***	3.67	TA(mv)	−0.20***	3.90	Bnk2SovRat	−0.28***	8.00

Panel B: Size, UpLift and Sovereign Risk

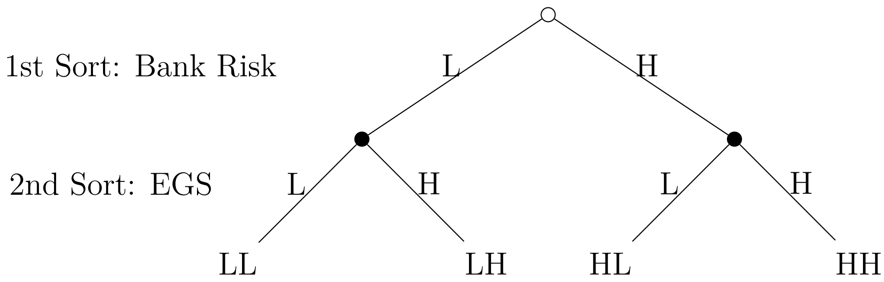
$R[PC_1]$			$R[PC_2]$			$R[PC_3]$		
Port.	ϕ	R^2	Port.	ϕ	R^2	Port.	ϕ	R^2
TA2GDP(bv)	0.23***	5.23	TA2GDP(bv)	−0.18***	3.31	TA2GDP(bv)	0.89***	79.31
UpLift	−0.11***	1.09	UpLift	0.12***	1.53	UpLift	0.26***	6.81
SovCDS	0.09*	0.72	SovCDS	−0.06	0.28	SovCDS	0.40***	14.58
SovYld	−0.04	0.12	SovYld	0.07	0.52	SovYld	0.30***	9.15
Sov.Exp.	0.10	0.74	Sov.Exp.	−0.06	0.26	Sov.Exp.	0.42***	15.27
Sov.Exp(c)	0.03	0.04	Sov.Exp(c)	0.01	−0.03	Sov.Exp(c)	0.41***	14.52

Fig. 1. Timing of actions in the model



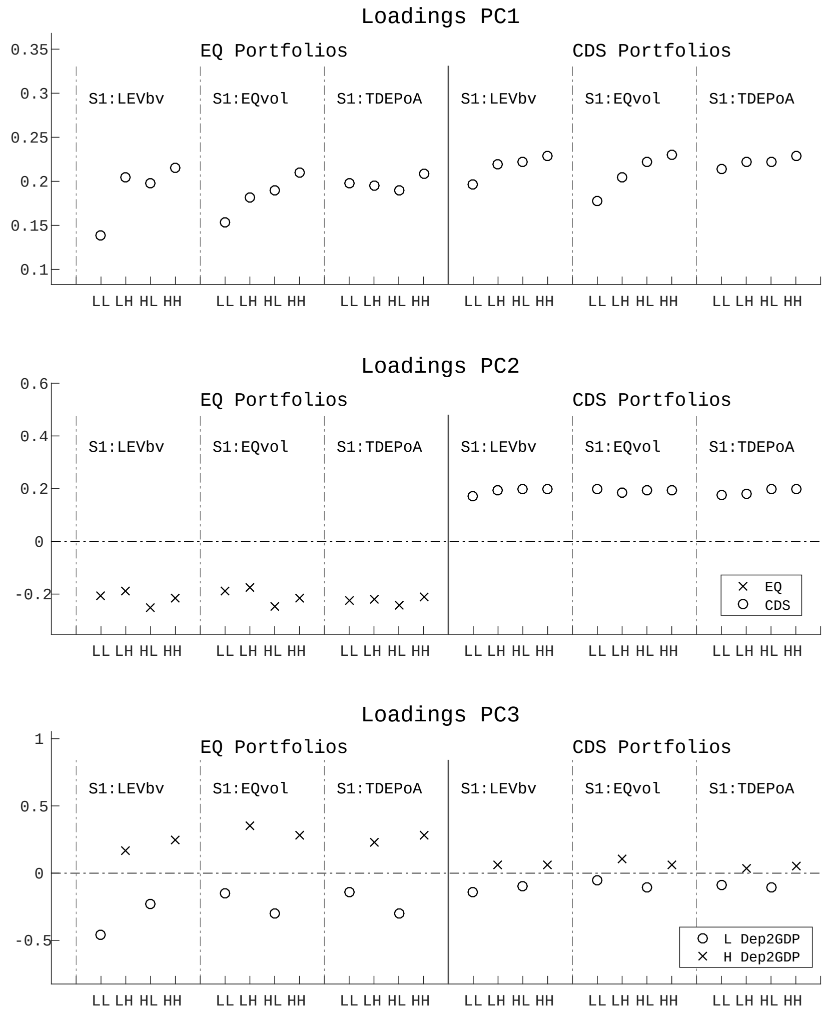
Note: The figure shows the sequence of the actions taken by the agents in the theoretical model.

Fig. 2. Portfolio sorting strategy



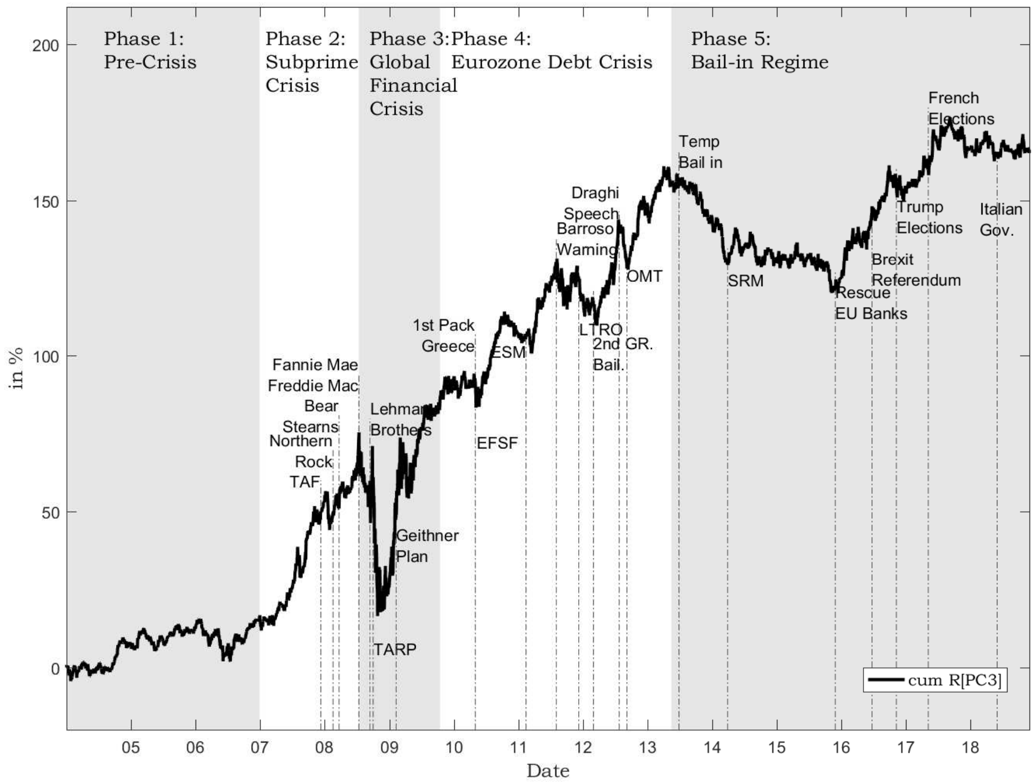
Note: The figure shows how we double sort banks into portfolios based on bank risk and the EGS instrument, i.e. deposits-to-GDP ratio. We use the following three alternative measures o bank risk: (book) leverage, equity volatility, and deposits to total assets; in the Internet Appendix (Table A2), we provide a detailed description of the sorting variables. We implement 2×2 sorts: we first group banks according to their risk (L,H), then, for a given level of bank risk, we group banks according to their EGS level. For a given variable of bank risk, the resulting double-sorted portfolios are LL, LH, HL, and HH, and the EGS spread portfolios are LH-LL for low bank risk, and HH-HL for high bank risk. We construct these double-sorted portfolios separately for equity and CDS returns. Portfolios are rebalanced at a monthly frequency.

Fig. 3. Level, security, and EGS factor loadings



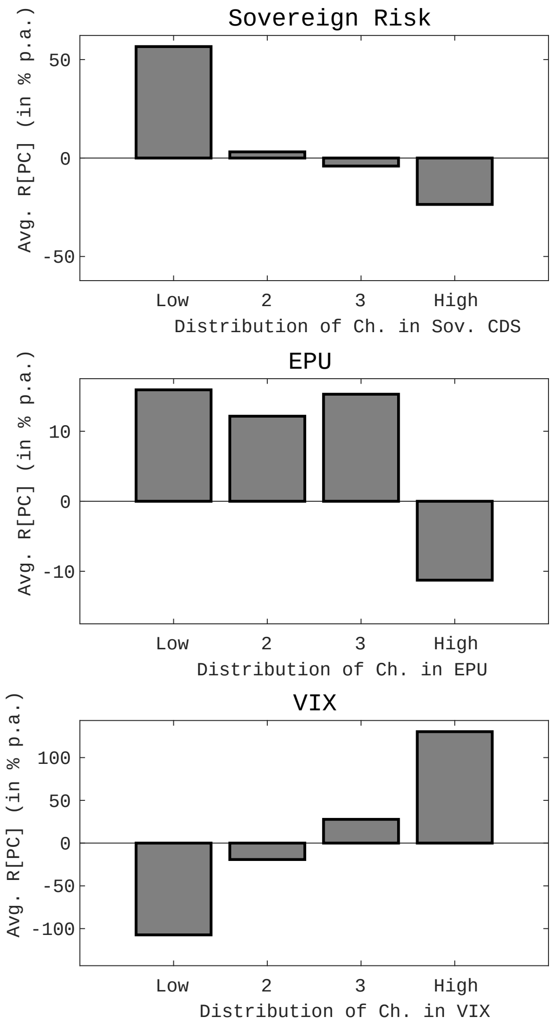
Note: The figure shows the joint principal component analysis (PCA) of the risk-adjusted equity and CDS excess returns of the double-sorted portfolios. Banks are first sorted on bank risk (low, high), and then on deposits to GDP (low, high), our proxy for the expected government support, i.e. Dep2GDP. Portfolios are rebalanced at a monthly frequency. We use three measures of bank risk: bank book leverage (S1: LEV bv), equity volatility estimated over a three-month rolling windows (S1: EQ vol), and deposits to total assets (S1: Dep2TA). For each measure of bank risk, we obtain four portfolios. The resulting double-sorted equally-weighted equities and CDS portfolios are regressed on standard risk factors such as: i) changes in Term, i.e. the 10- minus the 2-yr US Treasury rates; ii) changes in TED, i.e. the difference between the interest rates on interbank loans (1-month Libor) and on short-term U.S. government debt (1-month TBill); iii) changes in Credit (Crd), i.e. the difference between high-yield and investment grade yields for the US; and, MSCI world stock market excess returns (Mkt). We perform the PCA analysis on standardized risk-adjusted excess returns, i.e. the standardized residuals from the first-pass regressions. PC loadings for the first-three PCs ($\widehat{\boldsymbol{w}}_j$, for j=1,2,3) are displayed. Left panels, i.e. EQ Portfolios, present the loadings associated with the equity portfolios, whereas right panels, i.e. CDS Portfolios, those with the CDS portfolios. The double-sorted portfolios are denoted by LL, LH, HL, HH, where the first letter denotes the level of the first sorting variable (S1: bank risk) and the second letter that of the second sorting variable (S2: Dep2GDP). The sample includes the developed countries' banks and spans the period 1/2004–11/2018 at a daily frequency.

Fig. 4. EGS factor with events



Note: The figure shows the cumulative sum of the expected government support (EGS) factor with selected relevant economic, financial, and policy events. The EGS factor ($R[PC_3]_t = \boldsymbol{xr}_t \widehat{\boldsymbol{w}}_3'$) is obtained as the sum of portfolios excess returns times the principal component (PC) weights, displayed in the bottom panel of Fig. 3, associated with the third PC obtained from the joint PCA analysis of double-sorted equity and CDS bank portfolios. The EGS factor is long in high deposits-to-GDP banks and short in low deposits-to-GDP banks. Shaded areas delimit the following phases: Phase 1: Pre-crisis (01/2004–12/2006); Phase 2: Sub-prime crisis (01/2007–07/2008); Phase 3: Global financial crisis (07/2008–10/2009); Phase 4: Eurozone debt crisis (11/2009–04/2013); and, Phase 5: Bail-in regime (05/2013–11/2018). The sample includes developed countries' banks and spans the period 01/2004–11/2018 at a daily frequency.

Fig. 5. EGS factor, economic policy uncertainty, sovereign risk, and VIX



Note: The figure shows mean excess returns for the expected government support (EGS) factor ($R[PC_3]_t = \boldsymbol{xr}_t \widehat{\boldsymbol{w}}_3'$) conditional on innovations to sovereign risk (top panel), the Economic Policy Uncertainty (EPU) Index (mid panel), and VIX (bottom panel), being within the lowest and highest quartile of their sample distributions (four categories from lowest highest shown on the x-axis of each panel). The EGS factor, resulting from the joint PC analysis of double-sorted equity and CDS bank risk-adjusted excess returns, is long in high deposits-to-GDP banks and short in low deposits-to-GDP banks. Sovereign risk is measured as the mean of developed countries' 5-year CDSs. We exclude those observations for which either sovereign CDSs are not available or display zero changes, which reflect the limited number of sovereign CDSs available at the beginning of the sample. Fig. A8 in the Internet Appendix illustrates the results when these observations are not excluded. VIX is the CBOE Volatility Index. The daily EPU Index quantifies newspaper coverage of policy-related economic uncertainty (see www.policyuncertainty.com). The sample includes the developed country banks and spans the period 01/2004 -11/2018 at a daily frequency.

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Internet Appendix
(not for publication)

Risky Bank Guarantees

Appendix I. CDS Returns

A CDS is a single-name over-the-counter insurance contract. The protection seller takes on the risk of an agreed event against the payment of a premium from the protection buyer. The protection seller covers the loss that the protection buyer might incur contingent on the credit event. In return, the protection buyer pays a quarterly premium, quoted as annualized percentage of the notional value, to the protection seller. The protection buyer stops paying the premium to the seller when the contract reaches maturity or, before then, if the credit event materializes. The three principal credit events for corporate borrowers are bankruptcy, failure to pay, and restructuring.

In what follows, we show how to compute CDS excess-returns using as input CDS spreads; thus, we detail the steps necessary to derive Eq. (10), Section 3.2, which we repeat here for convenience:

$$r_{i,t}^{CDS} = \underbrace{CDS_i(t-1,T)/252}_{\substack{\text{Carry}\\ \text{Component}}} - \underbrace{\Delta CDS_i(t,T) \times RD_i(t,T)}_{\substack{\text{Capital-gain}\\ \text{Component}}}, \tag{I.1}$$

where $CDS_i(t,T)$ is the annualized premium for the CDS contract maturing in T-years written on a generic bank i, and $RD_i(t,T)$ is the risky duration.

Next, we show how to derive the capital-gain component; we follow closely the methodology proposed by Berndt and Obreja (2010). We start from the premise that a portfolio that combines a long position in a T-year par defaultable bond issued by bank i with a short position in a T-year par riskless bond replicates a 100% leveraged position in the risky bond. The resulting cash-flows, to a close approximation, equal the cash-flows resulting from selling protection on bank i via a T-year CDS contract with a nominal value at par;[35] therefore, the change in value of the CDS contract (we omit the bank identifier for simplicity) is given by:

$$\underbrace{\Delta V_{CDS}}_{\substack{\text{change in value}\\ \text{CDS contract}}} = \underbrace{\Delta P_D}_{\substack{\text{change in value}\\ \text{defaultable bond}}} - \underbrace{\Delta P_{RF}.}_{\substack{\text{change in value}\\ \text{risk-free bond}}} \tag{I.2}$$

Then, by dividing each side by par, we obtain the CDS-implied excess return on defaultable debt associated with the capital gain component,

$$xr_D = \Delta V_{CDS} = -\Delta CDS(t,T)RD(t,T), \tag{I.3}$$

where the risky duration, or annuity, is given by

$$RD(t,T) = 1/4 \sum_{s=1}^{4T} \delta(t,s/4)q(s;\lambda). \tag{I.4}$$

Therefore, to compute RD(t,T), we need estimates of the risk-less discount curve, $\delta(t,s) = e^{-rf_t \times s}$, and, the survival probabilities, $q(s;\lambda) = e^{-\lambda \times s}$. Specifically, we use the data provided by Gürkaynak et al. (2007) to construct the risk-less discount curve. We instead detail below the steps to extract the default intensity from CDS contracts.

Extracting risk-neutral intensity of default. Let assume that the premium is paid quar-

[35] Over a short interval, the change in value of the CDS contract is equal to the change in value of the long-short bond position (Duffie and Singleton, 2003).

terly and the default intensity λ is constant; then, the present value of the *premium leg* of a CDS contract is given by

$$P(t,T) = CDS(t,T) \underbrace{\left(1/4 \sum_{s=1}^{4T} \delta(t, s/4) q(s; \lambda)\right)}_{\text{T-year annuity, RD(t,T)}}. \tag{I.5}$$

Next, given a constant risk-neutral fractional recovery rate $R^{\mathbb{Q}}$, the protection leg is

$$PR(t,T) = (1 - R^{\mathbb{Q}}) \left(\sum_{s=1}^{4T} \delta(t, s/4)\ (q((s-1)/4; \lambda) - q(s/4; \lambda))\right). \tag{I.6}$$

At inception time t, the fair value $CDS(t,T)$ is determined such that the premium leg, P(t,T), is equal to the protection leg, PR(t,T),

$$\begin{aligned} CDS(t,T)RD(t,T) &= (1 - R^{\mathbb{Q}}) \left(\sum_{s=1}^{4T} \delta(t, s/4)\ (q((s-1)/4; \lambda) - q(s/4; \lambda))\right) \\ &= (1 - R^{\mathbb{Q}}) \left(\sum_{s=1}^{4T} \delta(t, s/4)\ (e^{-\lambda(s-1)/4} - e^{-\lambda s/4}\right) \\ &= (1 - R^{\mathbb{Q}}) \left(\sum_{s=1}^{4T} \delta(t, s/4)\ e^{-\lambda s/4}(e^{\lambda/4} - 1)\right) \\ &= (1 - R^{\mathbb{Q}}) \underbrace{\sum_{s=1}^{4T} \delta(t, s/4)\ e^{-\lambda s/4}}_{4\,\times\,\text{RD(t,T)}}(e^{\lambda/4} - 1). \end{aligned} \tag{I.7}$$

Thus, the bank-i intensity of default is given by

$$\lambda = 4\log\left(1 + \frac{CDS(t,T)}{4(1 - R^{\mathbb{Q}})}\right). \tag{I.8}$$

We use 5-year contracts to compute the CDS implied excess return on defaultable debt, so that T=5 years.

However, CDS returns also include the premium component. We therefore depart from Berndt and Obreja (2010) and add to the capital gain component the premium component, similar to He et al. (2017), among others. As a result, time-t CDS excess-returns for bank-i are given by:

$$xr_{i,t}^{CDS} = r_{i,t}^{CDS} - rf_{t-1}. \tag{I.9}$$

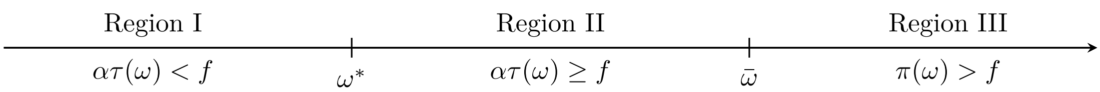
Appendix II. Risk premiums of debt and equity claims

As pointed out in Section 2 of the paper, the investors in the theoretical framework can be thought of as holding a portfolio consisting of a debt and an equity claim on the bank. The payoffs of these two claims, being functions of the managers' choices, vary non-trivially with the strength of the government guarantee. As a result, it is cumbersome to characterize the effects of the guarantee on the risk premiums of debt and equity claims when they are considered separately. For this reason, we assume here that the level of risk taking does not vary with the strength of the guarantee. In this way, we are able to analyze the risk premiums of debt and equity claims separately, though in a framework which does not feature all the mechanisms uncovered in Section 2. Thus, the treatment of the issue here should be viewed as shedding light on some potential reasons behind the observed differences between the two claims.

Formally, the asset payoff in this simplified framework is given by

$$\pi(\omega) = \begin{cases} \pi & \text{if } \omega \geq \bar{\omega} \\ 0 & \text{if } \omega < \bar{\omega}, \end{cases} \tag{II.1}$$

with π and $\bar{\omega}$ being fixed parameters, rather than equilibrium objects as in Section 2. Suppose that the investors and the managers stipulate a debt contract specifying a reimbursement of $f < \pi$, and additionally agree that a share of profits net of the debt reimbursement is paid to the investors. Denoting this share of the equity held by the investors by θ, the payoff of their equity claim is given by $\theta \max\{0, \pi(\omega) - f\}$. Also, let the guarantee be such that $\tau(\omega)$ is increasing in ω, $\alpha\tau(\bar{\omega}) > f$ and that there exists ω^* such that $\alpha\tau(\omega^*) = f$. These assumptions imply that in all of the states of the world in which the bank's assets yield the positive payoff π, i.e. $\omega \geq \bar{\omega}$, the debt holders are fully reimbursed. This, however, is not the case in all of the states in which the investors obtain a transfer from the government, $\omega < \bar{\omega}$. Moreover, due to the priority of debt over equity, when the debt holders are only partially reimbursed by the government, the equity holders obtain nothing. More precisely, the assumptions about the structure of the payoffs and the guarantee allow the state space to be partitioned into the following three regions:



The investors' debt and equity claim yield the following payoffs in these three regions of the state space:

Region I: Given that the transfer from the government falls short of f, the debt holders are only partially reimbursed, obtaining $\alpha\tau(\omega)$. The equity claims yields a payoff of 0 as debt holders obtain the entire transfer from the government.

Region II: As the transfer from the government exceeds f, the debt holders are fully reimbursed. Thus, the payoffs of the debt and equity claims are f and $\alpha\tau(\omega) - f$, respectively.[36]

Region III: Given that the bank's assets yield the positive payoff π, there is no transfer from the government. The debt claim yields f and the equity claim $\theta(\pi - f)$.

[36] Recall that the investors obtain the entire transfer from the government $\alpha\tau(\omega)$. For this reason, the payoff of the equity claim does not depend on θ in Region II.

Partitioning the state space in this way illustrates how the debt and equity claims are influenced by the guarantee in different states of the world. Such effects can be analyzed more formally by deriving the risk premiums of these two claims. Following analogous steps as in Section 2.2.2 yields the following expressions:

$$\mathbb{E}[R_d] - \bar{R} = \left\{ \frac{\alpha \int_{-\infty}^{\omega^*} \tau(\omega)\mathrm{d}F(\omega) + f\left[1 - F(\omega^*)\right]}{\alpha \int_{-\infty}^{\omega^*} \tau(\omega)\mathrm{d}G(\omega) + f\left[1 - G(\omega^*)\right]} - 1 \right\} \bar{R} \tag{II.2}$$

$$\mathbb{E}[R_e] - \bar{R} = \left\{ \frac{\int_{\omega^*}^{\bar{\omega}} \left[\alpha\tau(\omega) - f\right]\mathrm{d}F(\omega) + \theta(\pi - f)\left[1 - F(\bar{\omega})\right]}{\int_{\omega^*}^{\bar{\omega}} \left[\alpha\tau(\omega) - f\right]\mathrm{d}G(\omega) + \theta(\pi - f)\left[1 - G(\bar{\omega})\right]} - 1 \right\} \bar{R}, \tag{II.3}$$

where R_d and R_e denote the returns of the debt and the equity claim, respectively. Differentiating with respect to α and rearranging as in the proof of Proposition 2 delivers:

$$\frac{\mathrm{d}}{\mathrm{d}\alpha}\left\{\mathbb{E}[R_d] - \bar{R}\right\} \geq 0 \;\Leftrightarrow\; \frac{\alpha \int_{-\infty}^{\omega^*} \tau(\omega)\mathrm{d}F(\omega)}{\alpha \int_{-\infty}^{\omega^*} \tau(\omega)\mathrm{d}G(\omega)} \geq \frac{1 - F(\omega^*)}{1 - G(\omega^*)} \tag{II.4}$$

$$\frac{\mathrm{d}}{\mathrm{d}\alpha}\left\{\mathbb{E}[R_e] - \bar{R}\right\} \geq 0 \;\Leftrightarrow\; \frac{\int_{\omega^*}^{\bar{\omega}} \left[\alpha\tau(\omega) - f\right]\mathrm{d}F(\omega)}{\int_{\omega^*}^{\bar{\omega}} \left[\alpha\tau(\omega) - f\right]\mathrm{d}G(\omega)} \geq \frac{1 - F(\bar{\omega})}{1 - G(\bar{\omega})}. \tag{II.5}$$

As in Proposition 2, the inequalities can be interpreted in terms of different risk premiums. The left-hand side of each inequality reflects the risk premium of the guarantee. However, debt and equity claims are influenced by the riskiness of the guarantee in different states of the world. The equity holders obtain a transfer from the government only in Region II. Thus, the effect of an increase in the strength of the guarantee on the risk premium of the equity claim depends on how the guarantee varies across the states of the world in Region II. The debt holders, on the other hand, are fully reimbursed by the government in Region II, and obtain a partial reimbursement in Region I. For this reason, a marginal increase in the strength of the guarantee only has an effect on the payoff of the debt claim in Region I. How the risk premium of the debt claim changes when the guarantee becomes stronger thus depends on the riskiness of the guarantee in Region I.

For each claim, the riskiness of the guarantee in the relevant states of the world, captured by the left-hand side, is compared to the riskiness of the claim when it yields the full payoff. For the equity claim, the right-hand side term in Eq. (II.4) reflects the risk premium of the underlying, unguaranteed equity claim. For the debt claim, on the other hand, the right-hand side term in Eq. (II.5) captures the riskiness of the debt claim not only in Region III but also in Region II as the debt holders are fully reimbursed by the government in the latter region.

Our empirical results suggest that in the case of equity claims stronger government guarantees are associated with higher risk premiums. In the case of debt claims, there is much weaker evidence of such an association. This finding would be consistent with the inequality in Eq. (II.4) being violated and that in Eq. (II.5) being satisfied. Let us examine why this may be the case. Note that the debt holders benefit from an increase in the strength of the guarantee in Region I, i.e. the "worst" states of the world. In these states, the investors' highly value an additional unit of payoff, implying that $G'(\omega)$ exceeds $F'(\omega)$. Consequently, even though the guarantee may vary across the states of the world, the risk premium associated with it is likely to be small in Region I. In the "intermediate" states of the world of Region II, on the other hand, the investors attach a lower value to an additional unit of payoff. Therefore, the risk premium of the equity guarantee depends more strongly on its variability across the states of the world, and may exceed that of the underlying unguaranteed equity claim. These considerations suggest that a guarantee which varies across the states of the world can: (i) generate different risk premia for debt and equity claims, and (ii) have more scope to raise the risk premium of an equity claim.

It is, however, worth pointing out that the mechanism discussed here is only one among many possible explanations for the differences between the risk premiums of equities and CDSs that we uncover. As pointed out in Section 4 of the paper, the differences could equally well be related to the smaller variability of CDS returns, which makes it difficult to estimate a statistically significant risk premium. In light of these observations, we believe that examining competing explanations for the differential effects of guarantees on different financing instruments constitutes an important avenue for future theoretical and empirical research.

Appendix III. Additional Tables

Table A1: Bank names and data

This table reports bank names, along with information about the bank asset returns and key sorting variables. Specifically, we report the country identifier (ISO), the asset returns (CDS and equities), book leverage (Lev bv), equity volatility (EQ vol), bank deposits (Dep.), and the rating uplift (UpLift). Variables are defined in Table (A2). The ✓-tick indicates if a variable is available, while the ✗-tick if it is not available. As for the subsidiary indicator (Subs.) column, a bank is denoted as a subsidiary (✓-tick) using the Capital IQ classification; specifically, we label a bank subsidiary, when the ultimate parent is another entity, having a different name according to Capital IQ. The banks form the Developed Country sample, for a total of 88 banks, which is the benchmark sample we use throughout the paper. The list of countries, with the ISO code in braces, is Italy (IT), Spain (ES), Germany (DE), France (FR), the Netherlands (NL), Belgium (BE), the United Kingdom (GB), Denmark (DK), the United States (US), Japan (JP), Switzerland (CH), Austria (AT), Australia (AU), Sweden (SE), and Norway (NO). Data sources: S&P Capital IQ for balance-sheet variables, CMA for CDS data, Datastream for equity returns and Bloomberg for Moody's rating uplifts.

Name	ISO	CDS	Eq.	Lev (bv)	EQVol	Dep.	UpLift	Subs.
ABN AMRO BANK	NL	✓	✗	✓	✗	✓	✓	✓
ALLIANCE & LEICESTER	GB	✓	✓	✓	✓	✓	✓	✓
AUSTRALIA AND NEW ZEALAND BANKING GROUP	AU	✓	✓	✓	✓	✓	✓	✗
BANCA MONTE DEI PASCHI DI SIENA	IT	✓	✓	✓	✓	✓	✓	✗
BANCA POPOLARE DI MILANO	IT	✓	✓	✓	✓	✓	✓	✗
BANCO BILBAO VIZCAYA ARGENTARIA	ES	✓	✓	✓	✓	✓	✓	✗
CAJA DE AHORROS DEL MEDITERRÁNEO	ES	✓	✓	✓	✓	✓	✓	✓
BANCO DE SABADELL	ES	✓	✓	✓	✓	✓	✓	✗
BANCO DI SICILIA	IT	✓	✗	✗	✗	✓	✓	✓
BANCO PASTOR	ES	✓	✓	✓	✓	✓	✓	✓
BANCO POPOLARE	IT	✓	✓	✓	✓	✓	✓	✗
BANCO POPULAR ESPAÑOL	ES	✓	✓	✓	✓	✓	✓	✗
BANCO SANTANDER	ES	✓	✓	✓	✓	✓	✓	✗
BANK OF AMERICA	US	✓	✓	✓	✓	✓	✓	✗
BANK OF SCOTLAND	GB	✓	✓	✓	✓	✓	✓	✓
BANKIA	ES	✓	✓	✓	✓	✓	✓	✓
BANKINTER	ES	✓	✓	✓	✓	✓	✓	✗
BARCLAYS BANK	GB	✓	✓	✓	✓	✓	✓	✓
BAWAG P.S.K.	AT	✓	✗	✓	✗	✓	✓	✗
BAYERISCHE LANDESBANK	DE	✓	✗	✓	✗	✓	✓	✓
BNP PARIBAS FORTIS	BE	✓	✗	✓	✗	✓	✓	✓
BNP PARIBAS	FR	✓	✓	✓	✓	✓	✓	✗
BRADFORD & BINGLEY	GB	✓	✓	✓	✓	✗	✓	✓
CAIXA D'ESTALVIS DE CATALUNYA	ES	✓	✗	✓	✗	✓	✓	✗
CAIXA DE AFORROS DE GALICIA	ES	✓	✗	✓	✗	✓	✓	✗
CAIXABANK	ES	✓	✓	✓	✓	✓	✓	✗
BANCO CAM	ES	✓	✗	✓	✗	✓	✓	✗
CAPITAL ONE BANK (USA)	US	✓	✓	✗	✓	✓	✓	✓
CITIBANK	US	✓	✓	✓	✓	✓	✓	✗

Name	ISO	CDS	Eq.	Lev (bv)	EQVol	Dep.	UpLift	Subs
COMMERZBANK	DE	✓	✓	✓	✓	✓	✓	✗
COMMONWEALTH BANK OF AUSTRALIA	AU	✓	✓	✓	✓	✓	✓	✗
COÖPERATIEVE CENTRALE RAIFFEISEN-BOER.	NL	✓	✗	✓	✗	✓	✓	✗
COUNTRYWIDE BANK	US	✓	✓	✓	✓	✗	✓	✓
CRÉDIT AGRICOLE	FR	✓	✓	✓	✓	✓	✓	✓
DANSKE BANK	DK	✓	✓	✓	✓	✓	✓	✗
DEXIA CRÉDIT LOCAL	FR	✓	✓	✓	✓	✗	✓	✓
DNB BANK	NO	✓	✓	✓	✓	✓	✓	✓
DRESDNER BANK	DE	✓	✓	✓	✓	✓	✓	✓
DZ BANK	DE	✓	✗	✓	✗	✓	✓	✗
ERSTE GROUP BANK	AT	✓	✓	✓	✓	✓	✓	✗
HSBC BANK	GB	✓	✓	✓	✓	✓	✓	✓
HSH NORDBANK	DE	✓	✗	✓	✗	✓	✓	✓
IKB DEUTSCHE INDUSTRIEBANK	DE	✓	✓	✓	✓	✓	✓	✗
ING BANK	NL	✓	✗	✓	✗	✓	✓	✓
INTESA SANPAOLO	IT	✓	✓	✓	✓	✓	✓	✗
JPMORGAN CHASE BANK	US	✓	✓	✓	✓	✓	✓	✗
KBC BANK	BE	✓	✓	✓	✓	✓	✓	✗
LANDESBANK BADEN-WÜERTTEMBERG	DE	✓	✗	✓	✗	✓	✓	✗
LANDESBANK HESSEN-THÜRINGEN	DE	✓	✗	✓	✗	✓	✓	✗
LLOYDS BANK	GB	✓	✓	✓	✓	✓	✓	✓
MACQUARIE BANK	AU	✓	✓	✓	✓	✓	✓	✓
MIZUHO BANK	JP	✓	✓	✓	✓	✓	✓	✓
NATIONAL AUSTRALIA BANK	AU	✓	✓	✓	✓	✓	✓	✗
NATIXIS	FR	✓	✓	✓	✓	✓	✓	✓
NIBC BANK	NL	✓	✓	✓	✓	✓	✓	✓
NORDDEUTSCHE LANDESBANK GIROZENTRALE	DE	✓	✗	✓	✗	✓	✓	✗
NORDEA BANK	SE	✓	✓	✓	✓	✓	✓	✗
RAIFFEISEN BANK INTERNATIONA	AT	✓	✓	✓	✓	✓	✓	✓
RAIFFEISEN ZENTRALBANK ÖSTERREICH	AT	✓	✗	✓	✗	✓	✓	✓
SANPAOLO IMI	IT	✓	✓	✓	✓	✓	✓	✓
SANTANDER UK	GB	✓	✓	✗	✓	✗	✓	✓
SKANDINAVISKA ENSKILDA BANKEN	SE	✓	✓	✓	✓	✓	✓	✗
SNS BANK	NL	✓	✓	✓	✓	✓	✓	✓
SOCIÉTÉ GÉNÉRALE	FR	✓	✓	✓	✓	✓	✓	✗
ST.GEORGE BANK	AU	✓	✓	✓	✓	✓	✓	✓
STANDARD CHARTERED BANK	GB	✓	✓	✓	✓	✓	✓	✓
SUMITOMO MITSUI BANKING CORPORATION	JP	✓	✓	✓	✓	✓	✓	✓
SUNTRUST BANK	US	✓	✓	✓	✓	✓	✓	✗
SVENSKA HANDELSBANKEN	SE	✓	✓	✓	✓	✓	✓	✗
SWEDBANK	SE	✓	✓	✓	✓	✓	✓	✗
BANK OF TOKYO-MITSUBISHI UFJ	JP	✓	✓	✓	✓	✓	✓	✓
NORINCHUKIN BANK	JP	✓	✗	✓	✗	✓	✓	✗
PNC BANK	US	✓	✓	✓	✓	✓	✓	✗
ROYAL BANK OF SCOTLAND	GB	✓	✓	✓	✓	✓	✓	✓
U.S. BANK	US	✓	✓	✓	✓	✓	✓	✗
UNICREDIT BANK AUSTRIA	AT	✓	✓	✓	✓	✓	✓	✓
UNICREDIT	IT	✓	✓	✓	✓	✓	✓	✗
UBI BANCA	IT	✓	✓	✓	✓	✓	✓	✗
WACHOVIA BANK	US	✓	✓	✓	✓	✓	✓	✓
WELLS FARGO BANK	US	✓	✓	✓	✓	✓	✓	✗
WESTPAC BANKING CORPORATION	AU	✓	✓	✓	✓	✓	✓	✗
CREDIT SUISSE	CH	✓	✓	✓	✓	✓	✓	✗
DEUTSCHE BANK	DE	✓	✓	✓	✓	✓	✓	✗
MERRILL LYNCH BANK USA	US	✓	✓	✓	✓	✗	✓	✓
MORGAN STANLEY BANK	US	✓	✓	✓	✓	✗	✓	✗
PORTIGON	DE	✓	✗	✓	✗	✓	✓	✗
GOLDMAN SACHS BANK USA	US	✓	✓	✓	✓	✗	✓	✗
UBS	CH	✓	✓	✓	✓	✓	✓	✗

Table A2: Sorting variables and risk factors descriptions

This table reports sorting variables and risk factors' names, descriptions and sources.

	Sorting Variables	
	Description	Source
UpLift	Rating uplift, computed as the difference between the bank all-in-all credit rating, i.e. the bank's ability to repay it deposits obligations, measured using Moodys' foreign-currency deposit ratings, and the stand-alone credit rating, i.e. the bank's intrinsic safety and soundness, measured using Moody's bank financial strength (BFS), or bank credit assessment, ratings. Deposits ratings are converted into the BFS scale, and then into a numerical scale 1 (E) to 13 (A). The difference between the two types of rating gives the uplift.	Bloomberg
UpLift (%)	Percentage uplift indicates the fraction of bank rating which is due to the uplift, computed as the UpLift over the bank rating.	Bloomberg
TA (bv)	Total assets at book value.	Capital IQ
TL (bv)	Total liabilities at book value.	Capital IQ
EQ (bv)	Equity at book value constructed as the difference between TA (bv) and TL (bv).	Capital IQ
Lev (bv)	Leverage at book value constructed as the TA (bv) over EQ (bv)	Capital IQ
TA (mv)	Market value of total assets, which is constructed as total liabilities plus market value of equity.	Capital IQ
EQ (mv)	Market value of equity.	Capital IQ
Lev (mv)	Leverage at market value; TA (mv) over EQ (mv).	Capital IQ
ROA	Return on assets.	Capital IQ
TDebt	Total bank debt.	Capital IQ
STDebt	Short-term bank debt.	Capital IQ
CASHR	Cash reserves.	Capital IQ
D2D	Merton's distance-to-default measure computed as in Acharya, Anginer and Warburton (2015; AAW).	Capital IQ
ZSCORE	Z-score, constructed as the sum of ROA and equity ratio (ratio of EQ (bv) to TA (bv)), averaged over four years, divided by the standard deviation of ROA over the period (see, AWW 2015).	Capital IQ
PVB	Ratio of market and book value of equity.	Capital IQ
Loan	Total bank loans.	Capital IQ
Dep.	Total bank deposits.	Capital IQ
Loan2TA	Bank loans over total assets.	Capital IQ
Dep2TA	Total bank deposits over bank total assets.	Capital IQ
DVR	Dividend ratio.	Capital IQ
TA2GDP (bv)	Book value of total assets to the country GDP.	OECD & Capital IQ
TA2GDP (mv)	Market value of total assets to the country GDP.	OECD & Capital IQ

	Sorting Variables (cntd')	
	Description	Source
iBCA	Moody's bank credit assessment rating, converted into the 1-13 scale, with 1 indicating the highest bank quality.	Bloomberg
SP	Bank survival probability derived from Merton model as in AWW (2015).	Capital IQ
SovYld	10-year sovereign bond yields.	CMA
SovCDS	5-year sovereign CDS.	CMA
BnkCDS	5-year bank CDS.	CMA
iSovRat	Moody's sovereign rating, converted into the 1-13 scale, with 1 indicating the highest issuer quality.	Bloomberg
Sov.Exp.	Banks' sovereign exposures, estimated from market prices, by regressing bank daily CDS returns on the domestic sovereign CDS returns over three-month rolling windows.	CMA
Sov.Exp(c)	Banks' sovereign exposures with controls, estimated as Sov.Exp. but by adding standard risk factors as controls in the regression.	CMA
B2SRat	Ratio of bank rating (iBCA) and sovereign rating (iSovRat).	Bloomberg
EQvol	Stock return volatility computed using returns over the past 3 months.	Datastream
	Risk Factors	
	Description	Source
Mkt	The market excess return is computed as the MSCI world stock market return minus the 1-month TBill.	FRED & Datastream
TED	The spread is the difference between the interest rates on interbank loans (1-month Libor) and on short-term U.S. government debt (1-month TBill).	Datastream
Crd	Credit is the difference between US high-yield and investment-grade yields.	FRED
Term	The term spread is the difference between the 10- minus the 2-yr US Treasury rates.	FRED
G-SMB	The Fama-French global SMB factor.	French's website
G-HML	The Fama-French global HML factor.	French's website
G-MOM	The Fama-French global momentum factor.	French's website

Table A3: Bank asset return statistics

This table presents daily asset return statistics for the mean bank, and the 25th, 50th and 75th percentiles for the cross section of developed country banks displayed in Table A2. We report the mean return and standard deviation (both annualized), the minimum and maximum daily returns, and the first order autocorrelation coefficient (AC(1)). Panel A shows summary statistics for equity returns, while Panel B for CDS returns. Period A presents the summary statistics for the full-sample period 2004-2018, whereas Periods B-E the subperiod analysis.

	Panel A: Equity Returns				Panel B: CDS Returns			
	Period A: 01/2004-11/2018							
	Mean	25th	50th	75th	Mean	25th	50th	75th
Mean (% p.a.)	-4.44	-253.1	-10.21	228.98	0.85	-15.92	0.64	17.14
Std.Dev. (% p.a.)	28.05	29.37	26.55	28.04	2.49	2.44	1.93	2.46
Min (%)	-19.83	-22.31	-16.00	-8.63	-1.23	-1.58	-0.96	-0.66
Max (%)	17.1	10.55	17.23	24.00	2.54	0.68	1.62	3.18
AC(1)	0.1	0.19	0.08	0.12	0.31	0.41	0.29	0.35
	Period B: 01/2004-06/2007							
	Mean	25th	50th	75th	Mean	25th	50th	75th
Mean (% p.a.)	20.31	-137.99	10.84	164.00	0.27	-2.74	0.10	3.04
Std.Dev. (% p.a.)	11.70	11.92	11.75	11.77	0.20	0.22	0.16	0.20
Min (%)	-3.05	-4.17	-3.14	-2.09	-0.10	-0.16	-0.12	-0.02
Max (%)	2.46	1.67	2.98	3.62	0.11	0.02	0.13	0.17
AC(1)	0.07	0.11	0.07	0.05	0.14	0.29	0.08	0.20
	Period C: 06/2007-10/2009							
	Mean	25th	50th	75th	Mean	25th	50th	75th
Mean (% p.a.)	-34.46	-454.72	-40.64	354.81	-0.69	-28.26	0.20	26.80
Std.Dev. (% p.a.)	49.22	49.50	45.87	48.63	3.76	3.14	2.84	3.60
Min (%)	-19.83	-22.31	-16.00	-8.63	-1.23	-1.58	-0.96	-0.39
Max (%)	17.10	10.55	17.23	24.00	2.54	0.38	1.62	3.18
AC(1)	0.09	0.18	0.06	0.09	0.32	0.43	0.26	0.25
	Period D: 10/2009-11/2018							
	Mean	25th	50th	75th	Mean	25th	50th	75th
Mean (% p.a.)	-6.33	-244.8	-10.59	220.7	1.45	-17.7	0.95	19.92
Std.Dev. (% p.a.)	24.72	25.8	23.62	24.56	2.54	2.6	2.00	2.47
Min (%)	-13.63	-20.94	-10.73	-6.23	-1.09	-1.44	-0.92	-0.66
Max (%)	10.79	5.84	9.84	15.2	1.45	0.68	1.30	2.01
AC(1)	0.11	0.14	0.09	0.12	0.31	0.37	0.31	0.36
	Period E: 06/2007-11/2018							
	Mean	25th	50th	75th	Mean	25th	50th	75th
Mean (% p.a.)	-11.78	-287.3	-16.45	248.26	1.02	-19.83	0.80	21.33
Std.Dev. (% p.a.)	31.29	32.5	29.53	31.18	2.83	2.73	2.20	2.75
Min (%)	-19.83	-22.31	-16.00	-8.63	-1.23	-1.58	-0.96	-0.66
Max (%)	17.10	10.55	17.23	24	2.54	0.68	1.62	3.18
AC(1)	0.10	0.18	0.07	0.11	0.31	0.39	0.29	0.33

Table A4: First-pass equity and CDS regressions with the PC EGS factor

This table presents the first-pass time-series regressions of equity and CDS double-sorted portfolio excess returns (LL, HL, HL, HH) and the spread portfolio returns (L H/L and H H/L) on the risk factors and the EGS factor. Banks are first sorted on bank risk (low, high), and then on deposits to GDP (low, high), our proxy for the expected government support. For a given measure of bank risk, spread portfolios are given by LH-LL for low bank risk, and HH-HL for high bank risk. We use three measures of bank risk: bank book leverage (Leverage), equity volatility (EQ Vol.), and deposits to total assets (Dep2TA). Portfolios are rebalanced at a monthly frequency. The EGS factor ($PC_{3,t} = \tilde{\boldsymbol{\epsilon}}_t \widehat{\mathbf{w}}'_3$) is the third principal component (PC) obtained from the joint PC analysis of double-sorted equity and CDS bank portfolios, presented in the Internet Appendix (Fig. A2). The EGS factor is long in high deposits-to-GDP banks and short in low deposits-to-GDP banks. The resulting double-sorted and spread portfolios are regressed on standard risk factors ($\mathbf{f}_t$) and the EGS factor ($PC_{3,t}$), such as $rx_{it} = \alpha_i + \mathbf{f}_t\boldsymbol{\beta}_i + \gamma PC_{3,t} + e_{it}$, where i denotes the selected portfolio. $\overline{rx}_i$ is the mean excess return of portfolio i. The $\mathbf{f}_t$ vector includes changes in Term, changes in TED, changes in Credit (Crd), and MSCI world stock market excess returns (Mkt). The sample covers Developed Country banks and spans the period from 01/2004 to 11/2018 at a daily frequency. Adjusted R^2s are in percent. ***,**,* denote significance, respectively, at the 1-, 5- and 10-percent levels, based on GMM-VARHAC standard errors.

	Panel A: EQUITY Returns						Panel B: CDS Returns					
	Leverage (L)			Leverage (H)			Leverage (L)			Leverage (H)		
	L	H	H/L	L	H	H/L	L	H	H/L	L	H	H/L
$\overline{rx}_i$	-4.50	-1.96	2.54	-9.42	-1.25	8.17**	-0.47	-0.59	-0.12	-0.25	-0.61	-0.37
con	-10.07**	-6.77	3.31	-14.53***	-6.19	8.34***	-0.68	-0.72	-0.05	-0.41	-0.76	-0.35
Term	3.32*	6.33***	3.01*	5.16***	5.60***	0.44	1.39***	1.10***	-0.29	1.18***	1.00***	-0.18
TED	0.99	-1.29	-2.28**	0.06	-1.45	-1.51***	-0.69**	-0.40	0.30	-0.75**	-0.37	0.38***
Crd	1.09	-6.95***	-8.05***	-3.21***	-7.53***	-4.31***	-1.17***	-1.44***	-0.27***	-1.37***	-1.30***	0.07
Mkt	1.50***	1.35***	-0.16***	1.41***	1.37***	-0.04**	0.08***	0.05***	-0.03***	0.06***	0.05***	-0.01*
R[PC]	-137.81***	47.88***	185.69***	-60.33***	67.33***	127.67***	-6.17***	2.08***	8.24***	-3.64***	1.83***	5.47***
R^2	75.79	65.27	68.70	69.05	69.02	76.76	31.74	33.39	13.70	34.14	34.09	12.31
	EQ Vol. (L)			EQ Vol. (H)			EQ Vol. (L)			EQ Vol. (H)		
	L	H	H/L	L	H	H/L	L	H	H/L	L	H	H/L
$\overline{rx}_i$	-4.55	-0.03	4.52	-9.66	-1.33	8.33**	-0.90	-0.82	0.08	-0.38	-0.61	-0.23
con	-8.71**	-4.32	4.39	-14.98***	-6.23	8.74***	-1.04	-0.97**	0.07	-0.58	-0.76	-0.18
Term	4.39***	1.05	-3.34***	4.79***	5.52***	0.72	0.75***	0.28	-0.47*	1.35***	1.01***	-0.34
TED	-0.47	-2.49	-2.02**	0.59	-2.03	-2.62***	-0.22	-0.37	-0.16	-0.86**	-0.42	0.44***
Crd	-2.16***	-7.64***	-5.49***	-2.20**	-8.30***	-6.10***	-1.07***	-1.15***	-0.07	-1.41***	-1.32***	0.09
Mkt	1.15***	1.12***	-0.03	1.46***	1.36***	-0.10***	0.05***	0.04***	-0.01	0.07***	0.05***	-0.02***
R[PC]	-29.21***	84.82***	114.02***	-78.69***	80.39***	159.08***	-1.73**	2.83***	4.56***	-4.29***	1.95***	6.24***
R^2	70.06	71.38	51.18	72.13	68.96	85.06	26.36	31.75	6.47	35.43	34.06	16.89
	Dep2TA (L)			Dep2TA (H)			Dep2TA (L)			Dep2TA (H)		
	L	H	H/L	L	H	H/L	L	H	H/L	L	H	H/L
$\overline{rx}_i$	-12.77	-1.43	11.35***	-10.29	-0.37	9.92**	-0.12	-0.74	-0.61	-0.21	-0.61	-0.40
con	-17.68***	-6.86	10.82***	-15.55***	-5.27	10.27***	-0.29	-0.91	-0.62	-0.37	-0.76	-0.38
Term	9.04***	8.51***	-0.53	5.14***	5.28***	0.15	1.39***	1.02***	-0.37**	1.14***	0.96***	-0.18
TED	-0.79	-1.65	-0.86	0.66	-1.91	-2.57***	-0.83*	-0.30	0.54***	-0.81**	-0.34	0.47***
Crd	-6.01***	-6.68***	-0.66	-2.27**	-8.02***	-5.75***	-1.48***	-1.21***	0.27**	-1.38***	-1.28***	0.10
Mkt	1.42***	1.55***	0.13***	1.45***	1.35***	-0.10***	0.07***	0.06***	-0.00	0.06***	0.05***	-0.01*
R[PC]	-43.33***	78.47***	121.80***	-79.55***	80.52***	160.07***	-3.33***	1.12	4.45***	-3.66***	1.72***	5.37***
R^2	61.56	64.53	41.91	71.66	69.20	84.17	34.49	32.42	8.02	35.10	33.89	12.12

Table A5: Test for spreads in factor betas across portfolios

This table reports results for running the following tests: $\beta_{jk} = 0$ (Panel A) and $\beta_{jk} = \beta_j$ (Panel B) $\forall j$, for each factor $k =$ TED, Term, Crd, Mkt, R[PC$_3$]. The factor betas β_{jk}s are those estimated in the first-pass regressions with (top two rows in each panel) and without (bottom two rows in each panel) the return EGS factor R[PC$_3$], which are reported, respectively, in Tables 1 and 2. We show the results for $j = 24$ (2S), i.e. when only double-sorted portfolios are included, and for $j = 36$, i.e. when the spread portfolios are included along with the double-sorted portfolios (All). The period is 01/2004-11/2018. We report the p-values based on the VARHAC GMM approach.

	Panel A: $\beta_{jk} = 0$					
	con	Term	TED	Crd	Mkt	R[PC3]
2S	0.18	0.00	0.11	0.00	0.00	
All	0.00	0.00	0.00	0.00	0.00	
2S	0.04	0.00	0.08	0.00	0.00	0.00
All	0.00	0.00	0.00	0.00	0.00	0.00
	Panel B: H0: $\beta_{jk} = \beta_k$					
	con	Term	TED	Crd	Mkt	R[PC3]
2S	0.39	0.00	0.16	0.00	0.00	
All	0.00	0.00	0.00	0.00	0.00	
2S	0.05	0.00	0.06	0.00	0.00	0.00
All	0.00	0.00	0.00	0.00	0.00	0.00

Table A6: Second-pass equity and CDS cross-sectional regressions using PC EGS factor

This table reports results for running the cross-sectional regression $\overline{rx}_i = \boldsymbol{\beta}_i' \boldsymbol{\lambda} + a_i$, where $\overline{rx}_i$ is the mean excess return of portfolio i, and $\widehat{\boldsymbol{\beta}}_i$ is the vector of factor betas associated with portfolio i, resulting from the first-pass regressions (Table A4 in the Internet Appendix). For the factor prices of risk ($\boldsymbol{\lambda}$), Shanken p-values are in squared brackets, GMM-VARHAC p-values are in braces, and bootstrapped p-values are in angled brackets. We also report the cross-sectional adjusted R^2, the pricing error test statistics (PE Test) p-values based on GMM-VARHAC, along with the mean absolute pricing errors (MAE). ΔMAE denotes the difference between the MAE resulting from the model with EGS factor, and the MAE resulting from the model without EGS factor; statistical significance is tested using the bootstrap replications, whereby $^{***},^{**},^{*}$ denote significance, respectively, at the 1-, 5- and 10-percent levels. Top panels report the results for the model with standard risk factors ($\mathbf{f}_t$) but without the EGS factor, while bottom panels add the EGS factor ($PC3_t$) beta to the set of standard risk factors. Left panels show the analysis for the full-sample period (01/2004-11/2018), while right panels exclude the bail-in period (01/2004-06/2013). The analysis covers developed country banks' equity and CDS portfolios.

Panel A: Model without EGS Factor

	Panel A.I: Full Sample (2004-18)					Panel A.II: Sample ex Bail-in (2004-13)			
	λ	Shan.	GMM	Boot		λ	Shan.	GMM	Boot
Term	-0.73	[0.062]	{0.135}	<0.140>	Term	-0.72	[0.092]	{0.123}	<0.198>
TED	-4.83	[0.018]	{0.038}	<0.267>	TED	-4.38	[0.029]	{0.045}	<0.380>
Crd	0.79	[0.212]	{0.265}	<0.392>	Crd	0.37	[0.402]	{0.416}	<0.295>
Mkt	-0.56	[0.461]	{0.468}	<0.328>	Mkt	-3.65	[0.318]	{0.334}	<0.233>
	R^2	PE Test	MAE			R^2	PE Test	MAE	
	74.2	0.975	1.89			72.3	0.969	2.71	

Panel B: Model with EGS Factor

	Panel B.I: Full Sample (2004-18)					Panel B.II: Sample ex Bail-in (2004-13)			
	λ	Shan.	GMM	Boot		λ	Shan.	GMM	Boot
Term	-0.32	[0.228]	{0.258}	<0.225>	Term	-0.74	[0.079]	{0.098}	<0.106>
TED	-3.21	[0.023]	{0.047}	<0.087>	TED	-3.49	[0.042]	{0.068}	<0.186>
Crd	2.02	[0.032]	{0.048}	<0.038>	Crd	2.99	[0.057]	{0.075}	<0.101>
Mkt	3.18	[0.285]	{0.298}	<0.314>	Mkt	3.44	[0.335]	{0.342}	<0.415>
R[PC]	0.08	[0.013]	{0.020}	<0.013>	R[PC]	0.11	[0.009]	{0.013}	<0.008>
	R^2	PE Test	MAE	ΔMAE		R^2	PE Test	MAE	ΔMAE
	93.6	0.974	0.92	0.97^{**}		94.7	0.998	1	1.70^{**}

Table A7: First-pass equity and CDS regressions with EGS Factor: 2004-2013

This table presents the first-pass time-series regressions of equity and CDS double-sorted portfolio excess returns (LL, HL, HL, HH) and the spread portfolios returns (L H/L and H H/L) on the risk factors and the EGS factor. Banks are first sorted on bank risk (low, high), and then on deposits to GDP (low, high), our proxy for the expected government support. For a given measure of bank risk, spread portfolios are given by LH-LL for low bank risk, and HH-HL for high bank risk. We use three measures of bank risk: bank book leverage (Leverage), equity volatility (EQ Vol.), and deposits to total assets (Dep2TA). Portfolios are rebalanced at a monthly frequency. The EGS factor ($R[PC_3]_t = \mathbf{xr}_t\widehat{\mathbf{w}}_3'$) is obtained as the sum of double-sorted portfolio excess returns times the principal component (PC) weights associated with the third PC obtained from the joint PCA analysis of double-sorted equity and CDS bank portfolios. The EGS factor is long in high deposits-to-GDP (Dep2GDP) banks and short in low Dep2GDP banks. The resulting double-sorted and spread portfolios are regressed on standard risk factors ($\mathbf{f}_t$) and the EGS factor ($R[PC_3]_t$), such as $rx_{it} = \alpha_i + \mathbf{f}_t\boldsymbol{\beta}_i' + \gamma R[PC_3]_t + e_{it}$, where i denotes the selected portfolio. $\overline{rx}_i$ is the mean excess return of portfolio i. The $\mathbf{f}_t$ vector includes changes in Term, changes in TED, changes in Credit (Crd), and MSCI world stock market excess returns (Mkt). The sample covers Developed Country banks and spans the period from 01/2004 to 06/2013 at a daily frequency. Adjusted R^2s are in percent. ***,**,* denote significance, respectively, at the 1-, 5- and 10-percent levels, based on GMM-VARHAC standard errors.

	Panel A: EQUITY Returns						Panel B: CDS Returns					
	Leverage (L)			Leverage (H)			Leverage (L)			Leverage (H)		
	L	H	H/L	L	H	H/L	L	H	H/L	L	H	H/L
$\overline{rx}_i$	-9.09	-3.94	5.15	-11.54	-2.55	8.99*	-1.55	-1.66*	-0.11	-1.41	-1.51	-0.10
con	-4.81	-11.86*	-7.06*	-12.81**	-11.99*	0.81	-1.73	-2.04**	-0.31	-1.64	-1.89**	-0.25
Term	1.49	5.37***	3.89***	3.33	4.05*	0.72	1.67***	1.20***	-0.47	1.38***	1.10***	-0.28
TED	-0.20	-0.30	-0.10	-0.07	0.01	0.09	-0.75**	-0.39	0.35	-0.80**	-0.36	0.44***
Crd	-2.33**	-3.41***	-1.08	-3.28***	-3.30***	-0.02	-1.06***	-1.18***	-0.12	-1.22***	-1.08***	0.14
Mkt	1.47***	1.45***	-0.01	1.43***	1.50***	0.06***	0.08***	0.05***	-0.03***	0.06***	0.06***	-0.01
R[PC]	-0.49***	0.27***	0.76***	-0.14***	0.35***	0.49***	0.00	0.02***	0.02**	0.01**	0.02***	0.01**
R^2	75.42	71.17	76.78	71.08	74.80	82.99	28.65	34.19	6.83	32.13	34.44	3.99
	EQ Vol. (L)			EQ Vol. (H)			EQ Vol. (L)			EQ Vol. (H)		
	L	H	H/L	L	H	H/L	L	H	H/L	L	H	H/L
$\overline{rx}_i$	-10.67	0.24	10.92**	-13.22	-1.49	11.73**	-1.63*	-1.61**	0.01	-1.51	-1.44	0.06
con	-12.89***	-9.19*	3.70	-13.21**	-11.91*	1.29	-1.84*	-2.00***	-0.16	-1.76	-1.83*	-0.07
Term	2.47	-0.71	-3.18***	3.26	3.59	0.33	0.91**	0.25	-0.66**	1.56***	1.11***	-0.45
TED	-0.19	-0.96	-0.77	0.17	-0.29	-0.47	-0.23	-0.34	-0.12	-0.91**	-0.41	0.50***
Crd	-2.13***	-3.39***	-1.27***	-3.03***	-3.56***	-0.53	-0.99***	-0.94***	0.05	-1.25***	-1.08***	0.17*
Mkt	1.16***	1.23***	0.06**	1.47***	1.49***	0.02	0.05***	0.04***	-0.01	0.08***	0.06***	-0.02***
R[PC]	-0.04	0.39***	0.43***	-0.22***	0.41***	0.64***	0.01**	0.02***	0.01***	0.01	0.02***	0.01**
R^2	69.66	76.81	55.02	73.63	75.12	91.79	25.15	33.06	3.11	33.65	34.48	9.07
	Dep2TA (L)			Dep2TA (H)			Dep2TA (L)			Dep2TA (H)		
	L	H	H/L	L	H	H/L	L	H	H/L	L	H	H/L
$\overline{rx}_i$	-15.50	-2.23	13.27**	-13.58	-0.68	12.90**	-1.20	-1.48	-0.28	-1.39	-1.44	-0.06
con	-18.42***	-13.14*	5.29	-13.54**	-11.03*	2.51	-1.43	-1.83*	-0.41	-1.62	-1.81*	-0.19
Term	7.21***	6.83**	-0.38	3.36	3.64	0.28	1.65***	1.13***	-0.53**	1.32***	1.06***	-0.26
TED	-0.77	0.30	1.08	0.24	-0.18	-0.42	-0.89**	-0.29	0.60***	-0.87**	-0.33	0.54***
Crd	-4.92***	-1.80	3.12***	-3.05***	-3.36***	-0.32	-1.35***	-1.00***	0.35***	-1.23***	-1.06***	0.17
Mkt	1.45***	1.71***	0.27***	1.46***	1.50***	0.04***	0.07***	0.07***	-0.01	0.06***	0.06***	-0.01
R[PC]	-0.03	0.42***	0.45***	-0.22***	0.41***	0.63***	0.00*	0.01***	0.01**	0.01*	0.01***	0.01*
R^2	65.91	70.01	45.12	73.47	75.10	91.39	33.79	32.40	5.09	33.18	34.19	4.42

Table A8: First-pass equity and CDS regressions robustness: additional risk factors

This table presents the first-pass time-series regressions of equity and CDS double-sorted portfolio excess returns (LL, HL, HL, HH) and the spread portfolios returns (L H/L and H H/L) on the risk factors. We perform the first-pass regressions as in Table 1 on a set of standard risk factors. However, we augment the set of risk factors by including the three Fama-French Global factors, namely SMB (G-SMB), HML (G-HML) and, MOM (G-MOM), in addition to Crd, Term, TED and Mkt. As a result, the SDF nows consists of seven factors. The sample covers all banks and spans the period from 01/2004 to 10/2018 at a daily frequency. Adjusted R^2s are in percent. ***,**,* denote significance, respectively, at the 1-, 5- and 10-percent levels, based on GMM-VARHAC standard errors.

	Panel A: EQUITY Returns						Panel B: CDS Returns					
	Leverage (L)			Leverage (H)			Leverage (L)			Leverage (H)		
	L	H	H/L	L	H	H/L	L	H	H/L	L	H	H/L
$\overline{rx}_i$	-4.80	-2.08	2.71	-9.49	-1.29	8.21**	-0.46	-0.57	-0.11	-0.23	-0.59	-0.36
con	-8.47**	-6.12	2.35	-13.19***	-5.42	7.76***	-0.58	-0.70	-0.12	-0.35	-0.71	-0.36
Term	0.87	4.66***	3.79	3.00*	3.85**	0.85	1.27***	1.02***	-0.25	1.08***	0.93***	-0.16
TED	1.20	-1.30	-2.50	0.18	-1.46	-1.64	-0.69**	-0.40	0.29	-0.75**	-0.37	0.38***
Crd	1.97*	-5.87***	-7.83***	-2.16**	-6.35***	-4.19***	-1.06***	-1.36***	-0.30***	-1.28***	-1.24***	0.04
Mkt	1.26***	1.26***	0.00	1.24***	1.29***	0.05	0.07***	0.05***	-0.02***	0.06***	0.05***	-0.01**
G-SMB	-0.26*	0.22**	0.48***	-0.02	0.25**	0.27***	0.03*	0.03***	0.00	0.03**	0.02*	-0.01
G-HML	1.53***	1.13***	-0.39***	1.38***	1.18***	-0.20***	0.08***	0.06***	-0.02*	0.07***	0.05***	-0.02
G-MOM	-0.47***	-0.31***	0.16**	-0.42***	-0.33***	0.09**	-0.03***	-0.01**	0.02***	-0.02***	-0.01**	0.01*
R^2	71.01	68.83	9.44	75.25	71.12	6.69	31.75	34.70	4.09	35.35	35.39	2.45

	EQ Vol. (L)			EQ Vol. (H)			EQ Vol. (L)			EQ Vol. (H)		
	L	H	H/L	L	H	H/L	L	H	H/L	L	H	H/L
$\overline{rx}_i$	-4.66	-0.11	4.55	-9.75	-1.36	8.40**	-0.87	-0.81	0.06	-0.35	-0.59	0.23
con	-8.05***	-3.78	4.27	-13.47***	-5.46	8.01**	-1.05	-0.93**	0.12	-0.51	-0.72	-0.21
Term	3.02***	0.03	-2.99**	2.58	3.80**	1.23	0.69**	0.23	-0.46*	1.23***	0.93***	-0.30
TED	-0.40	-2.56	-2.16	0.73	-2.03	-2.76*	-0.22	-0.37	-0.15	-0.86***	-0.42	0.44***
Crd	-1.53**	-6.48***	-4.94***	-1.09	-7.12***	-6.03***	-1.03***	-1.08***	-0.06	-1.32***	-1.26***	0.07
Mkt	1.05***	1.12***	0.07**	1.28***	1.28***	-0.00	0.05***	0.04***	-0.01	0.07***	0.05***	-0.02***
G-SMB	-0.01	0.43***	0.44***	-0.02	0.26*	0.28**	0.02**	0.02***	0.00	0.02*	0.02**	-0.00
G-HML	0.88***	0.72***	-0.16***	1.40***	1.16***	-0.24***	0.05***	0.04***	-0.01	0.08***	0.05***	-0.02**
G-MOM	-0.23***	-0.27***	-0.03	-0.45***	-0.33***	0.12**	-0.00	-0.01**	-0.01*	-0.02***	-0.01**	0.01**
R^2	74.59	66.68	8.27	76.46	69.16	8.23	26.99	31.88	1.26	36.49	35.35	7.19

	Dep2TA (L)			Dep2TA (H)			Dep2TA (L)			Dep2TA (H)		
	L	H	H/L	L	H	H/L	L	H	H/L	L	H	H/L
$\overline{rx}_i$	-12.78	-1.37	11.40***	-10.38	-0.39	10.00**	-0.10	-0.70	-0.60	-0.19	-0.58	-0.39
con	-16.66***	-5.53	11.13***	-14.06***	-4.56	9.50***	-0.20	-0.83	-0.64	-0.31	-0.71	-0.4
Term	6.92***	6.51***	-0.42	2.90*	3.60**	0.70	1.29***	0.94***	-0.35*	1.04***	0.88***	-0.15
TED	-0.73	-1.54	-0.81	0.80	-1.92	-2.72*	-0.83**	-0.29	0.54***	-0.81***	-0.34	0.47***
Crd	-4.87***	-5.63***	-0.76	-1.18	-6.85***	-5.67***	-1.38***	-1.17***	0.21*	-1.29***	-1.22***	0.06
Mkt	1.28***	1.40***	0.12***	1.26***	1.28***	0.02	0.06***	0.06***	-0.01**	0.06***	0.05***	-0.01**
G-SMB	0.10	0.03	-0.07	-0.04	0.28**	0.32***	0.03**	-0.00	-0.03***	0.03**	0.01	-0.01
G-HML	1.41***	1.29***	-0.12	1.42***	1.14***	-0.28***	0.06***	0.05***	-0.01	0.07***	0.05***	-0.01
G-MOM	-0.37***	-0.39***	-0.02	-0.45***	-0.32***	0.13**	-0.03***	-0.02**	0.01**	-0.02***	-0.01**	0.01**
R^2	67.61	66.27	1.72	76.06	69.15	8.25	35.93	33.86	4.06	36.37	35.21	3.26

Table A9: First-pass equity and CDS regressions with EGS factor robustness: additional risk factors

This table presents the first-pass time-series regressions of equity and CDS double-sorted portfolio excess returns (LL, HL, HL, HH) and the spread portfolios returns (L H/L and H H/L) on the risk factors and the EGS factor ($R[PC_3]_t$). However, as in Table A8, the set of risk factors includes the three Fama-French Global factors, namely SMB (G-SMB), HML (G-HML) and, MOM (G-MOM), in addition to Crd, Term, TED, and Mkt. The EGS factor obtained from the PC analysis of the residuals resulting from the seven-factor SDF first-pass regressions is presented in the Internet Appendix (Fig. A5). The sample covers all banks and spans the period from 01/2004 to 10/2018 at a daily frequency. Adjusted R^2s are in percent. ***,**,* denote significance, respectively, at the 1-, 5- and 10-percent levels, based on GMM-VARHAC standard errors.

	Panel A: EQUITY Returns						Panel B: CDS Returns					
	Leverage (L)			Leverage (H)			Leverage (L)			Leverage (H)		
	L	H	H/L	L	H	H/L	L	H	H/L	L	H	H/L
$\overline{rx}_i$	-4.80	-2.08	2.71	-9.49	-1.29	8.21**	-0.46	-0.57	-0.11	-0.23	-0.59	-0.36
con	-2.96	-9.29**	-6.34**	-11.27***	-9.59**	1.68	-0.60	-0.86	-0.26	-0.41	-0.87	-0.45
Term	1.16	4.49***	3.32***	3.11**	3.63**	0.53	1.27***	1.01***	-0.26	1.08***	0.92***	-0.16
TED	-0.44	-0.35	0.10	-0.39	-0.21	0.18	-0.69**	-0.35	0.33	-0.73**	-0.32	0.41***
Crd	-1.88**	-3.65***	-1.77**	-3.50***	-3.45***	0.05	-1.05***	-1.25***	-0.20	-1.23***	-1.13***	0.10
Mkt	1.20***	1.30***	0.10***	1.22***	1.33***	0.11***	0.07***	0.05***	-0.02***	0.06***	0.05***	-0.01*
G-SMB	-0.02	0.08	0.10	0.06	0.07	0.00	0.03*	0.02**	-0.00	0.02**	0.01	-0.01*
G-HML	1.23***	1.31***	0.08	1.28***	1.41***	0.13***	0.08***	0.06***	-0.01	0.07***	0.06***	-0.01
G-MOM	-0.37***	-0.37***	0.01	-0.38***	-0.40***	-0.02	-0.03***	-0.02***	0.01**	-0.02***	-0.02***	0.01
R[PC]	-0.46***	0.26***	0.72***	-0.16***	0.34***	0.50***	0.00	0.01***	0.01*	0.01*	0.01***	0.01**
R^2	83.04	73.04	74.28	76.88	78.28	84.26	31.74	36.11	5.53	35.53	36.78	3.76
	EQ Vol. (L)			EQ Vol. (H)			EQ Vol. (L)			EQ Vol. (H)		
	L	H	H/L	L	H	H/L	L	H	H/L	L	H	H/L
$\overline{rx}_i$	-4.66	-0.11	4.55	-9.75	-1.36	8.40**	-0.87	-0.81	0.06	-0.35	-0.59	-0.23
con	-7.43**	-8.31***	-0.88	-10.72***	-10.21***	0.52	-1.12*	-1.09**	0.02	-0.57	-0.88	-0.31
Term	3.06***	-0.21	-3.27***	2.72**	3.55**	0.83	0.68**	0.22	-0.47*	1.23***	0.92***	-0.31
TED	-0.59	-1.21	-0.62	-0.09	-0.61	-0.52	-0.20	-0.32	-0.12	-0.84***	-0.37	0.47***
Crd	-1.97***	-3.32***	-1.35***	-3.00***	-3.81***	-0.81**	-0.98***	-0.97***	0.01	-1.28***	-1.14***	0.14
Mkt	1.04***	1.17***	0.13***	1.25***	1.33***	0.08***	0.05***	0.04***	-0.01	0.07***	0.05***	-0.02***
G-SMB	0.02	0.23***	0.22***	0.10	0.05	-0.05	0.02*	0.02*	-0.00	0.02	0.01	-0.01
G-HML	0.85***	0.96***	0.12**	1.25***	1.42***	0.17***	0.05***	0.04***	-0.00	0.08***	0.06***	-0.02*
G-MOM	-0.22***	-0.35***	-0.12***	-0.40***	-0.41***	-0.02	-0.01	-0.02***	-0.01**	-0.03***	-0.02***	0.01**
R[PC]	-0.05**	0.38***	0.43***	-0.23***	0.39***	0.62***	0.01**	0.01***	0.01***	0.01	0.01***	0.01**
R^2	74.86	78.39	51.97	79.72	78.17	90.87	27.24	34.03	2.38	36.61	36.81	8.41
	Dep2TA (L)			Dep2TA (H)			Dep2TA (L)			Dep2TA (H)		
	L	H	H/L	L	H	H/L	L	H	H/L	L	H	H/L
$\overline{rx}_i$	-12.78	-1.37	11.40***	-10.38	-0.39	10.00**	-0.10	-0.70	-0.60	-0.19	-0.58	-0.39
con	-15.53***	-10.49**	5.03	-11.27***	-9.31***	1.96*	-0.25	-0.96	-0.71	-0.37	-0.86	0.49
Term	6.98***	6.24***	-0.74	3.05**	3.35**	0.30	1.28***	0.93***	-0.35*	1.03***	0.87***	0.16
TED	-1.07	-0.06	1.01	-0.03	-0.50	-0.47	-0.82**	-0.25	0.57***	-0.79**	-0.30	0.50***
Crd	-5.66***	-2.16	3.49***	-3.12***	-3.54***	-0.41	-1.34***	-1.08***	0.26**	-1.24***	-1.12***	0.12
Mkt	1.27***	1.45***	0.18***	1.24***	1.33***	0.10***	0.06***	0.06***	-0.01**	0.06***	0.05***	-0.01**
G-SMB	0.15	-0.19	-0.34***	0.08	0.07	-0.01	0.03**	-0.01	-0.03***	0.02**	0.01	-0.02**
G-HML	1.35***	1.56***	0.21***	1.27***	1.40***	0.13***	0.07***	0.06***	-0.01	0.07***	0.06***	0.01
G-MOM	-0.35***	-0.48***	-0.13***	-0.40***	-0.40***	-0.01	-0.03***	-0.02***	0.01**	-0.03***	-0.02**	0.01**
R[PC]	-0.09***	0.41***	0.50***	-0.23***	0.39***	0.62***	0.00*	0.01***	0.01**	0.01*	0.01***	0.01*
R^2	68.06	73.93	49.07	79.43	78.32	90.78	36.04	34.69	4.65	36.54	36.51	4.33

Table A10: Second-pass equity and CDS cross-sectional regressions robustness: additional risk factors

This table reports results for running the cross-sectional regression $\overline{rx}_i = \boldsymbol{\beta}_i' \boldsymbol{\lambda} + a_i$, where $\overline{rx}_i$ is the mean excess return of portfolio i, and $\widehat{\boldsymbol{\beta}}_i$ is the vector of factor betas associated with portfolio i, resulting from the first-pass regressions (Tables A8 and A9). For the factor prices of risk ($\boldsymbol{\lambda}$), Shanken p-values are in squared brackets, GMM-VARHAC p-values are in braces, and bootstrapped p-values are in angled brackets. We also report the cross-sectional adjusted R^2s, the pricing error test statistics (PE Test) p-values based on GMM-VARHAC, along with the mean absolute pricing errors (MAE). ΔMAE denotes the difference between the MAE resulting from the model with EGS factor, and the MAE resulting from the model without EGS factor; statistical significance is tested using the bootstrap replications, whereby ***,**,* denote significance, respectively, at the 1-, 5- and 10-percent levels. Top panels report the results for the model with standard risk factors but without the EGS factor, while bottom panels include the EGS factor in the set of standard risk factors. Left panels show the analysis for the full-sample period (01/2004-10/2018), while right panels exclude the bail-in period (01/2004-06/2013). The analysis covers all banks' equity and CDS portfolios.

Panel A: Model without EGS Factor

	Panel A.I: Full Sample (2004-18)					Panel A.II: Sample ex Bail-in (2004-13)			
	λ	Shan.	GMM	Boot		λ	Shan.	GMM	Boot
Term	-2.03	[0.009]	{0.091}	<0.076>	Term	-2.11	[0.009]	-0.002	<0.069>
TED	-1.61	[0.136]	{0.228}	<0.245>	TED	-2.21	[0.112]	-0.063	<0.286>
Crd	-2.14	[0.093]	{0.166}	<0.229>	Crd	-2.31	[0.119]	-0.069	<0.233>
Mkt	16.01	[0.103]	{0.188}	<0.354>	Mkt	3.73	[0.379]	-0.356	<0.380>
G-SMB	-40.00	[0.032]	{0.078}	<0.092>	G-SMB	-36.39	[0.052]	-0.021	<0.118>
G-HML	-10.38	[0.220]	{0.276}	<0.366>	G-HML	2.14	[0.433]	-0.416	<0.484>
G-MOM	29.48	[0.134]	{0.246}	<0.345>	G-MOM	27.5	[0.230]	-0.175	<0.418>
	R^2	PE Test	MAE			R^2	PE Test	MAE	
	88.2	0.999	1.25			90.4	0.999	1.5	

Panel B: Model with EGS Factor

	Panel B.I: Full Sample (2004-18)					Panel B.II: Sample ex Bail-in (2004-13)			
	λ	Shan.	GMM	Boot		λ	Shan.	GMM	Boot
Term	-1.22	[0.039]	-0.018	<0.069>	Term	-1.13	[0.071]	{0.085}	<0.070>
TED	-2.82	[0.014]	-0.005	<0.072>	TED	-2.25	[0.082]	{0.129}	<0.216>
Crd	0.97	[0.136]	-0.094	<0.286>	Crd	2.11	[0.069]	{0.112}	<0.208>
Mkt	-3.20	[0.386]	-0.366	<0.350>	Mkt	-17.67	[0.095]	{0.133}	<0.098>
G-SMB	-14.03	[0.179]	-0.133	<0.216>	G-SMB	2.23	[0.452]	{0.458}	<0.498>
G-HML	11.89	[0.127]	-0.085	<0.231>	G-HML	15.1	[0.080]	{0.091}	<0.189>
G-MOM	26.73	[0.142]	-0.098	<0.283>	G-MOM	9.98	[0.390]	{0.403}	<0.396>
R[PC]	12.84	[0.026]	-0.026	<0.063>	R[PC]	18.26	[0.026]	{0.017}	<0.023>
	R^2	PE Test	MAE	Δ MAE		R^2	PE Test	MAE	Δ MAE
	96.3	0.996	0.642	0.61**		98.1	1.0	0.6	0.89**

Table A11: First-pass equity and CDS regressions: core Europe

This table presents the first-pass time-series regressions of equity and CDS double-sorted portfolio excess returns (LL, HL, HL, HH) and the spread portfolio returns (L H/L and H H/L) on the risk factors. Banks are first sorted on bank risk (low, high), and then on deposits to GDP (low, high), our proxy for the expected government support. For a given measure of bank risk, spread portfolios are given by LH-LL for low bank risk, and HH-HL for high bank risk. We use three measures of bank risk: bank book leverage (Leverage), equity volatility (EQ Vol.), and deposits to total assets (Dep2TA). Portfolios are rebalanced at a monthly frequency. The resulting double-sorted and spread portfolios are regressed on standard risk factors ($\mathbf{f}_t$), such as $rx_{it} = \alpha_i + \mathbf{f}_t\boldsymbol{\beta}_i + e_{it}$, where i is the selected portfolio. The $\mathbf{f}_t$ vector includes changes in Term, changes in TED, changes in Credit (Crd), and MSCI world stock market excess returns (Mkt). $\overline{rx}_i$ is the mean excess return of portfolio i. The sample covers core EU (DE, FR, IT, ES, GB) banks and spans the period from 01/2004 to 11/2018 at a daily frequency. Adjusted R^2s are in percent. ***,**,* denote significance, respectively, at the 1-, 5- and 10-percent levels, based on GMM-VARHAC standard errors.

	Panel A: EQUITY Returns						Panel B: CDS Returns					
	Leverage (L)			Leverage (H)			Leverage (L)			Leverage (H)		
	L	H	H/L	L	H	H/L	L	H	H/L	L	H	H/L
$\overline{rx}_i$	-14.13	-7.73	6.40	-19.95**	-6.78	13.16***	-0.18	-0.70	-0.52	-0.02	-0.70	-0.68
con	-18.29**	-12.80**	5.49	-24.52***	-12.22**	12.31***	-0.30	-0.93	-0.63	-0.13	-0.92	-0.78
Term	11.58***	9.74***	-1.84	11.09***	9.34***	-1.75	1.94***	2.21***	0.28	1.31***	1.88***	0.57**
TED	0.12	-1.57	-1.69	0.88	-1.51	-2.39**	0.13	-0.25	-0.38	-0.26	-0.30	-0.05
Crd	-6.21***	-6.97***	-0.77	-5.91***	-6.78***	-0.87	-1.63***	-1.68***	-0.04	-1.57***	-1.51***	0.06
Mkt	1.27***	1.48***	0.20***	1.37***	1.56***	0.19***	0.06***	0.10***	0.03***	0.05***	0.09***	0.04***
R^2	40.71	52.97	4.30	47.61	57.34	4.63	19.82	29.15	3.89	25.27	30.81	7.02
	EQ Vol. (L)			EQ Vol. (H)			EQ Vol. (L)			EQ Vol. (H)		
	L	H	H/L	L	H	H/L	L	H	H/L	L	H	H/L
$\overline{rx}_i$	-13.98*	-4.56	9.43**	-19.84**	-9.06	10.78***	-0.69	-0.64	0.05	-0.27	-0.28	-0.01
con	-18.03***	-9.35*	8.68**	-24.48***	-14.55**	9.93**	-0.82	-0.88	-0.07	-0.41	-0.51	-0.10
Term	8.92***	9.16***	0.24	10.07***	10.07***	-0.00	1.80***	1.64***	-0.16	2.05***	2.04***	-0.01
TED	-0.82	-1.82	-1.00	0.40	-1.28	-1.68	0.05	-0.20	-0.25	-0.31	-0.29	0.02
Crd	-5.25***	-6.32***	-1.07*	-5.83***	-7.26***	-1.43**	-1.59***	-1.42***	0.18	-1.80***	-1.53***	0.27**
Mkt	1.20***	1.40***	0.20***	1.37***	1.59***	0.22***	0.06***	0.09***	0.03***	0.07***	0.10***	0.03***
R^2	47.39	58.43	4.77	48.28	56.52	6.02	17.09	31.09	1.69	24.64	31.07	2.16
	Dep2TA (L)			Dep2TA (H)			Dep2TA (L)			Dep2TA (H)		
	L	H	H/L	L	H	H/L	L	H	H/L	L	H	H/L
$\overline{rx}_i$	-21.16**	-6.74	14.42**	-21.73**	-6.54	15.20***	-0.22	-0.58	-0.37	-0.14	-0.49	-0.36
con	-25.77***	-12.66*	13.11**	-26.09***	-12.23*	13.87***	-0.35	-0.79	-0.44	-0.25	-0.71	-0.47
Term	12.07***	13.11***	1.03	10.24***	9.91***	-0.33	1.13***	1.93***	0.81***	1.41***	1.81***	0.40
TED	-0.38	-0.45	-0.06	0.32	-0.77	-1.09	-0.47	-0.34	0.13	-0.31	-0.30	0.00
Crd	-6.95***	-6.89***	0.07	-6.16***	-6.61***	-0.45	-1.42***	-1.41***	0.00	-1.60***	-1.47***	0.13
Mkt	1.40***	1.75***	0.36***	1.30***	1.64***	0.34***	0.05***	0.09***	0.03***	0.05***	0.09***	0.04***
R^2	44.44	54.16	5.32	44.94	57.19	7.93	25.45	30.38	6.27	24.84	31.07	5.74

Table A12: First-pass regressions with core EU EGS factor

This table presents the first-pass time-series regressions of equity and CDS double-sorted portfolio excess returns and the spread portfolios returns on the risk factors and the *core EU* EGS factor. The core EU EGS factor ($R[PC_3^{EU}]_t = \mathbf{xr}_t \widehat{\boldsymbol{\omega}}_3'$) is still obtained as the sum of double-sorted portfolio excess returns times the principal component (PC) weights. However, the weights are now those associated with the third PC obtained from the joint PC analysis of core EU double-sorted equity and CDS bank portfolios, rather than of developed countries' portfolios as in Table (6). Also in this case, the EGS factor is long in high deposits-to-GDP banks and short in low deposits-to-GDP banks. The resulting double-sorted and spread portfolios are regressed on standard risk factors ($\mathbf{f}_t$) and the core EU EGS factor ($R[PC_3^{EU}]_t$), such as $rx_{it} = a_i + \mathbf{f}_t \boldsymbol{\beta}_i + \gamma R[PC_3^{EU}]_t + e_{it}$, where i denotes the selected portfolio. $\overline{rx}_i$ is the mean excess return of portfolio i. The $\mathbf{f}_t$ vector includes changes in Term, changes in TED, changes in Credit (Crd), and MSCI world stock market excess returns (Mkt). The sample covers core EU (DE, FR, IT, ES, GB) banks and spans the period from 01/2004 to 11/2018 at a daily frequency. Adjusted R^2s are in percent. ***,**,* denote significance, respectively, at the 1-, 5- and 10-percent levels, based on GMM-VARHAC standard errors.

	Panel A: EQUITY Returns						Panel B: CDS Returns					
	Leverage (L)			Leverage (H)			Leverage (L)			Leverage (H)		
	L	H	H/L	L	H	H/L	L	H	H/L	L	H	H/L
$\overline{rx}_i$	-14.13	-7.73	6.40	-19.95**	-6.78	13.16***	-0.18	-0.70	-0.52	-0.02	-0.70	-0.68
con	-1.38	-4.26	-2.88	-9.20*	-7.39	1.81	0.70	-0.63	-1.32*	0.58	-0.71	-1.29**
Term	7.43***	7.65***	0.22	7.33***	8.16***	0.82	1.69***	2.14***	0.45	1.14***	1.83***	0.69***
TED	-1.24	-2.26	-1.02	-0.35	-1.90	-1.54**	0.05	-0.28	-0.33	-0.32	-0.32	-0.01
Crd	-3.65***	-5.68***	-2.03***	-3.60***	-6.05***	-2.45***	-1.48***	-1.63***	-0.15	-1.46***	-1.48***	-0.02
Mkt	0.99***	1.33***	0.34***	1.11***	1.48***	0.37***	0.05***	0.09***	0.05***	0.04***	0.08***	0.05***
R[PC^{EU}]	-1.82***	-0.92***	0.90***	-1.65***	-0.52***	1.13***	-0.11***	-0.03***	0.07***	-0.08***	-0.02**	0.05***
R^2	70.91	60.54	36.80	73.38	59.71	60.58	27.83	29.80	10.97	32.00	31.19	13.23
	EQ Vol. (L)			EQ Vol. (H)			EQ Vol. (L)			EQ Vol. (H)		
	L	H	H/L	L	H	H/L	L	H	H/L	L	H	H/L
$\overline{rx}_i$	-13.98*	-4.56	9.43**	-19.84**	-9.06	10.78***	-0.69	-0.64	0.05	-0.27	-0.28	-0.01
con	-6.73	-4.75	1.97	-9.71**	-9.08	0.64	-0.02	-0.77	-0.74	0.46	-0.33	-0.79
Term	6.15***	8.04***	1.89*	6.45***	8.73***	2.28**	1.60***	1.61***	0.00	1.83***	1.99***	0.16
TED	-1.73	-2.19	-0.46	-0.79	-1.72	-0.93	-0.01	-0.21	-0.20	-0.38	-0.30	0.07
Crd	-3.54***	-5.63***	-2.09***	-3.60***	-6.43***	-2.84***	-1.47***	-1.40***	0.07	-1.67***	-1.50***	0.17
Mkt	1.01***	1.32***	0.31***	1.12***	1.50***	0.38***	0.05***	0.09***	0.04***	0.06***	0.09***	0.04***
R[PC^{EU}]	-1.22***	-0.49***	0.72***	-1.59***	-0.59***	1.00***	-0.09***	-0.01	0.07***	-0.09***	-0.02**	0.07***
R^2	65.58	61.15	28.11	72.75	59.40	48.93	21.68	31.21	7.42	30.78	31.35	11.99
	Dep2TA (L)			Dep2TA (H)			Dep2TA (L)			Dep2TA (H)		
	L	H	H/L	L	H	H/L	L	H	H/L	L	H	H/L
$\overline{rx}_i$	-21.16**	-6.74	14.42**	-21.73**	-6.54	15.20***	-0.22	-0.58	-0.37	-0.14	-0.49	-0.36
con	-8.78*	-10.32	-1.54	-9.79**	-8.35	1.44	0.10	-0.62	-0.72	0.46	-0.51	-0.97*
Term	7.90***	12.53***	4.63**	6.24***	8.96***	2.72**	1.01***	1.89***	0.88***	1.24***	1.76***	0.52*
TED	-1.75	-0.63	1.12	-0.99	-1.08	-0.09	-0.51	-0.35	0.16	-0.36	-0.32	0.04
Crd	-4.38***	-6.53***	-2.15*	-3.70***	-6.03***	-2.33***	-1.35***	-1.39***	-0.04	-1.50***	-1.44***	0.06
Mkt	1.11***	1.72***	0.60***	1.03***	1.57***	0.55***	0.05***	0.08***	0.04***	0.04***	0.08***	0.04***
R[PC^{EU}]	-1.83***	-0.25*	1.58***	-1.75***	-0.42***	1.34***	-0.05***	-0.02**	0.03***	-0.08***	-0.02**	0.05***
R^2	72.03	54.57	52.45	75.09	58.59	60.93	28.38	30.66	8.20	31.07	31.46	11.77

Table A13: Second-pass cross-sectional regressions with core EU EGS factor

This table reports results for running the cross-sectional regression $\overline{rx}_i = \boldsymbol{\beta}_i'\boldsymbol{\lambda} + a_i$, where $\overline{rx}_i$ is the mean excess return of portfolio i, and $\widehat{\boldsymbol{\beta}}_i$ is the vector of factor betas associated with portfolio i, resulting from the first-pass regression (Tables A12 in the Internet Appendix). For the factor prices of risk ($\boldsymbol{\lambda}$), Shanken p-values are in squared brackets, GMM-VARHAC p-values are in braces, and bootstrapped p-values are in angled brackets. We also report the cross-sectional adjusted R^2s, the pricing error test statistics (PE Test) p-values based on GMM-VARHAC, along with the mean absolute pricing errors (MAE). ΔMAE denotes the difference between the MAE resulting from the model with EGS factor, and the MAE resulting from the model without EGS factor; statistical significance is tested using the bootstrap replications, whereby ***,**,* denote significance, respectively, at the 1-, 5- and 10-percent levels. Top panels report the results for the model with standard risk factors but without EGS factor, while bottom panels include the EGS factor in the set of standard risk factors. Left panels show the analysis for the full sample period (01/2004-11/2018), while right panels exclude the bail-in period (01/2004-06/2013). The analysis covers core EU (DE, FR, IT, ES, GB) banks' equity and CDS portfolios, and the EGS factor is generated for this specific sample.

Panel A: Model without EGS Factor

	Panel A.I: Full Sample (2004-18)					Panel A.II: Sample ex Bail-in (2004-13)			
	λ	Shan.	GMM	Boot		λ	Shan.	GMM	Boot
Term	-0.09	[0.472]	{0.482}	<0.287>	Term	-2.29	[0.088]	{0.122}	<0.301>
TED	-7.18	[0.016]	{0.045}	<0.242>	TED	-3.93	[0.041]	{0.080}	<0.312>
Crd	3.00	[0.085]	{0.206}	<0.419>	Crd	0.59	[0.382]	{0.409}	<0.423>
Mkt	2.95	[0.392]	{0.422}	<0.428>	Mkt	5.03	[0.315]	{0.348}	<0.376>
	R^2	PE Test	MAE			R^2	PE Test	MAE	
	79.5	1	3.09			68.3	0.999	3.47	

Panel B: Model with EGS Factor

	Panel B.I: Full Sample (2004-18)					Panel B.II: Sample ex Bail-in (2004-13)			
	λ	Shan.	GMM	Boot		λ	Shan.	GMM	Boot
Term	0.47	[0.264]	{0.285}	<0.441>	Term	0.13	[0.438]	{0.441}	<0.489>
TED	-1.67	[0.138]	{0.123}	<0.268>	TED	-1.48	[0.225]	{0.234}	<0.290>
Crd	0.39	[0.355]	{0.374}	<0.409>	Crd	1.12	[0.239]	{0.260}	<0.346>
Mkt	-3.97	[0.272]	{0.280}	<0.303>	Mkt	-0.41	[0.481]	{0.480}	<0.498>
R[PC^{EU}]	10.88	[0.000]	{0.001}	<0.001>	R[PC^{EU}]	11.37	[0.002]	{0.003}	<0.002>
	R^2	PE Test	MAE	ΔMAE		R^2	PE Test	MAE	ΔMAE
	97	0.871	1.11	1.99^{***}		97.1	0.993	1.2	2.27^{**}

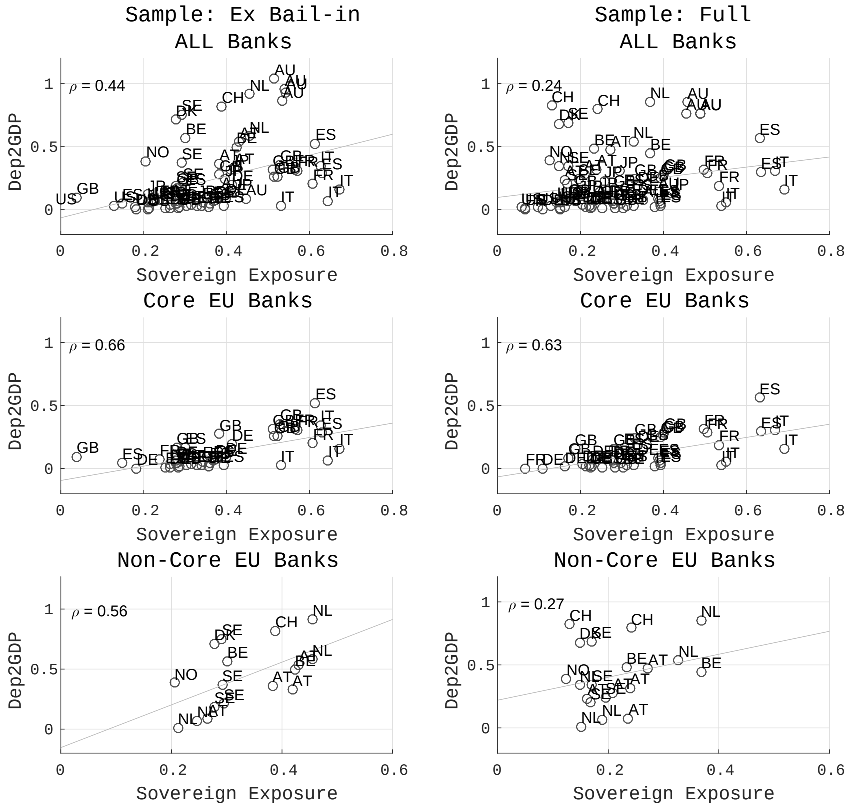
Table A14: What risks do the equity R[PC]s reflect?

This table reports results for running the regressions of the three equity R[PC]s on single-sorted bank equity spread portfolios (hml^{EQ}), which takes the form of $R[PC_j^{EQ}]_t = a_j + \phi_{jt} hml^{EQ} + u_{jt}$ for $j = 1, 2, 3$. Note that the EGS return factor in this case is that associated with the second PC weights. Single-sorted portfolios are constructed using balance-sheet and sovereign-risk variables as sorting variables; for a given sorting variable, banks are grouped into a high or low portfolios, then the spread portfolio is simply the high minus low portfolios. $R[PC_j^{EQ}]_t = \mathbf{xr}_t \widehat{\mathbf{w}}_j'$, where $\widehat{\mathbf{w}_j}$ are the principal component weights associated with the j-th PC, and $\mathbf{xr}_t$ are the equity portfolios' excess returns. Panel A shows the top 10 portfolios ordered in terms of the estimated R^2s. Panel B focuses on single-sorted portfolios constructed in terms of: i) sovereign risk, using domestic sovereign CDSs or sovereign yields as sorting variables; ii) bank sovereign exposures, obtained by regressing bank CDS returns on the domestic sovereign CDS returns, including (SovExp(c)) or not (Sov Exp) the standard risk factor as controls; and, iii) total assets at book value to GDP (TA2GDP(bv)) and the rating uplift (UpLift) as alternative measures of the EGS. The sample includes developed countries' banks. Variables are standardized. The period is 01/2000-11/2018. Adjusted R^2s are in percent. ***,**,* denote significance, respectively, at the 1-, 5- and 10-percent levels, based on the Newey-West approach with optimal lag selection.

Panel A: Horse Race								
$R[PC_1^{EQ}]$			$R[PC_2^{EQ}]$			$R[PC_3^{EQ}]$		
Port.	ϕ	R^2	Port.	ϕ	R^2	Port.	ϕ	R^2
EQvol	0.63***	39.37	Dep2GDP	0.93***	86.98	EQvol	0.73***	53.44
LEV(mv)	0.57***	32.78	TA2GDP(mv)	0.88***	77.89	BnkCDS	0.47***	20.55
PVB	−0.56***	31.86	TA2GDP(bv)	0.86***	74.80	ROA	−0.43***	18.08
ROA	−0.47***	22.54	Loan2GDP	0.85***	72.28	PVB	−0.41***	17.00
BnkCDS	0.47***	19.15	LEV(bv)	0.58***	33.79	ROACIQ	−0.39***	15.34
Dep2TA	−0.42***	17.70	BnkCDS	−0.51***	25.63	Dep2TA	−0.37***	13.70
ROACIQ	−0.33***	10.97	ULmixSov	0.44***	17.33	iSovRat	0.29***	8.12
TDebt	0.31***	9.44	ZSCORE	0.40***	16.30	SovRatFS	0.28***	7.64
TA(mv)	0.24***	5.69	Sov.Exp.	0.42***	14.73	iBCA	0.26***	6.66
LEV(bv)	0.22***	4.66	Sov.Exp(c)	0.42***	14.56	Sov.Exp(c)	0.21***	3.32
Panel B: Size, UpLift and Sovereign Risk								
$R[PC_1^{EQ}]$			$R[PC_2^{EQ}]$			$R[PC_3^{EQ}]$		
Port.	ϕ	R^2	Port.	ϕ	R^2	Port.	ϕ	R^2
TA2GDP(bv)	0.20***	3.93	TA2GDP(bv)	0.86***	74.80	TA2GDP(bv)	0.04	0.17
UpLift	−0.16***	2.46	UpLift	0.22***	4.67	UpLift	−0.06**	0.34
SovCDS	0.08	0.52	SovCDS	0.39***	13.99	SovCDS	0.19***	3.21
SovYld	−0.05	0.27	SovYld	0.28***	7.99	SovYld	0.02	0.01
Sov.Exp.	0.09	0.52	Sov.Exp.	0.42***	14.73	Sov.Exp.	0.27***	5.77
Sov.Exp(c)	0.02	−0.01	Sov.Exp(c)	0.42***	14.56	Sov.Exp(c)	0.21***	3.32

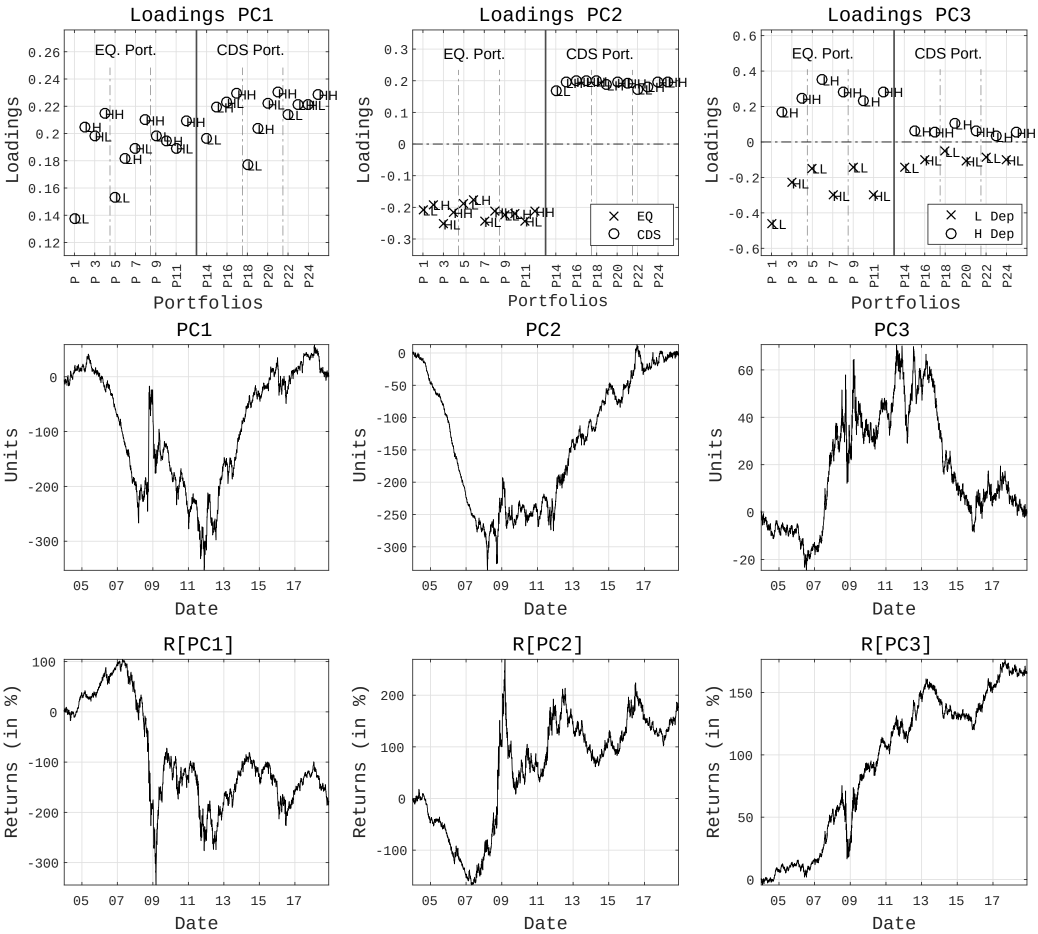
Appendix IV. Additional Figures

Fig. A1. Bank EGSs and sovereign exposures



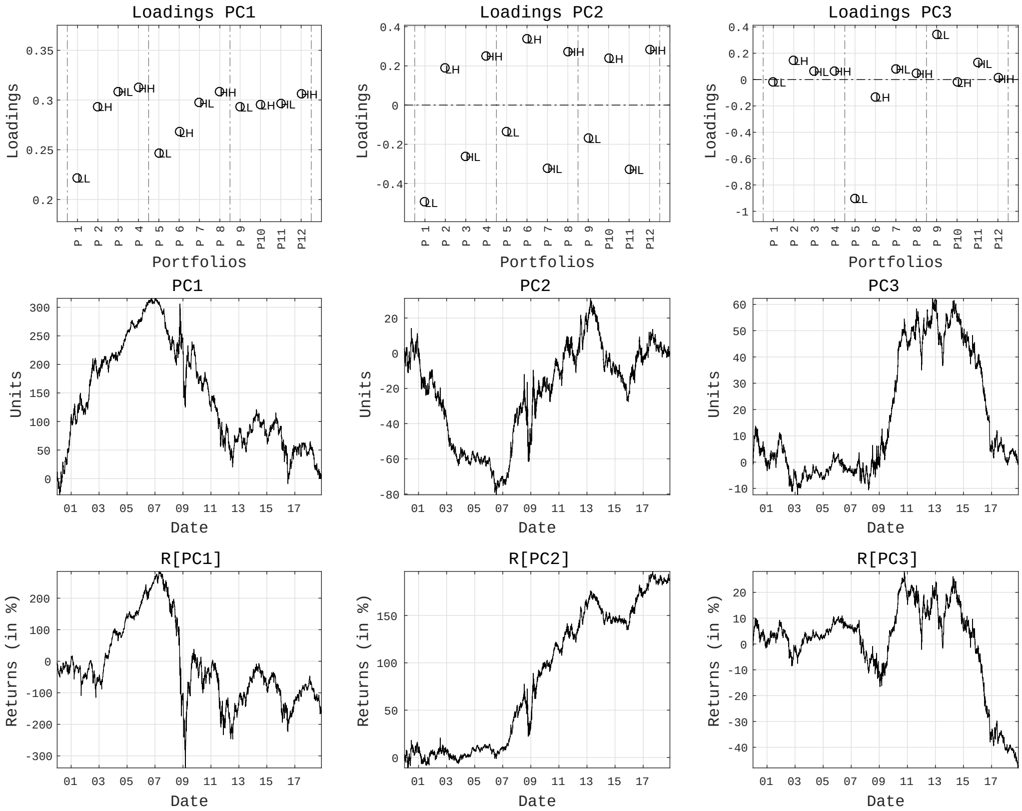
Note: The figure shows the scatter plot of banks' time-series averages of deposits to GDP on the y-axis and banks' sovereign exposures on the x-axis. Banks' sovereign exposures are estimated from market prices, by regressing bank daily CDS returns on the domestic sovereign CDS returns over three-month rolling windows, we then report the averages of the estimated rolling exposures. The panel of banks' exposures is unbalanced. Returns are standardized so that the estimated exposures are correlations. Top scatter plots show the results for the entire sample of banks (ALL Banks), mid plots for German, French, Italian, Spanish, and British banks (Core EU Banks), and bottom plots for the banks of the remaining EU countries (Non-Core EU Banks). Left plots refer to the ex bail-in period (2004–2013), whereas right plots to the full-sample period (2004–2018). The gray line denotes the fitted line, and ρ its slope, i.e. the sample correlation.

Fig. A2. Level, security, and EGS factors



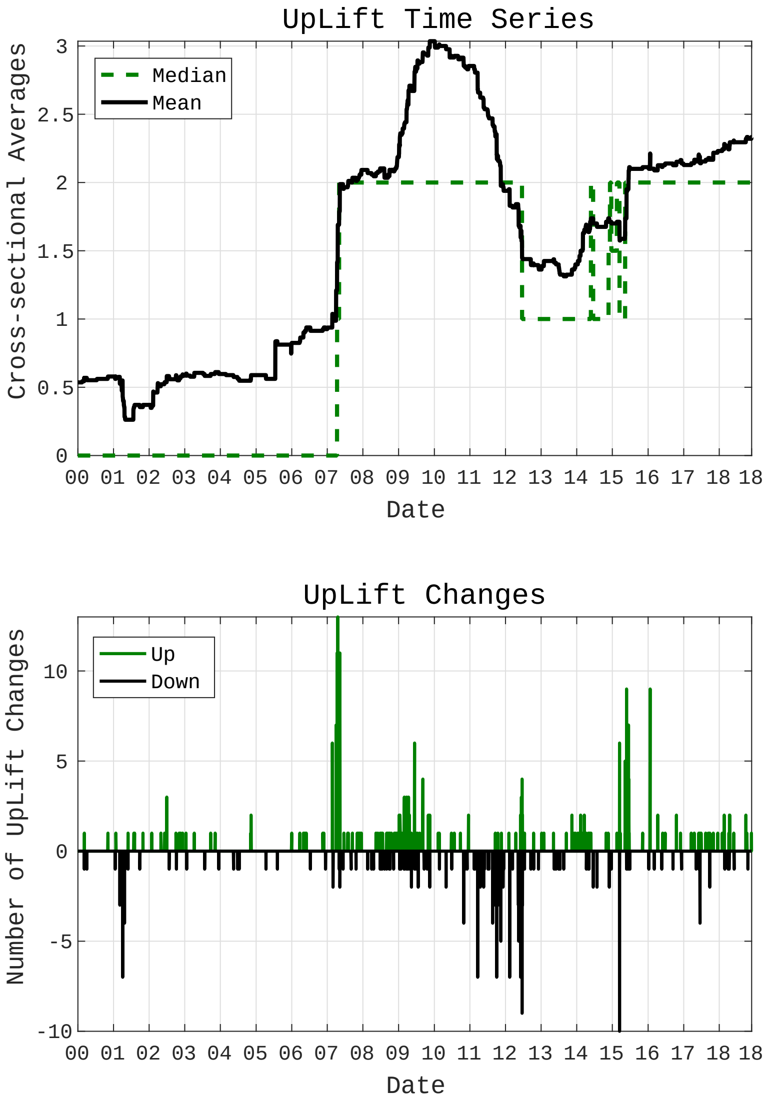
Note: The figure shows the joint principal component analysis (PCA) of the risk-adjusted equity and CDS excess returns of the double-sorted portfolios. Banks are first sorted on bank risk (low, high), and then on deposits to GDP (low, high), our proxy for the expected government support. Portfolios are rebalanced at a monthly frequency. We use three measures of bank risk: bank book leverage (EQ: P1-P4 and CDS: P13-P16), equity volatility estimated over a three-month rolling windows (EQ: P5-P8 and CDS: P17-P20), and deposits to total assets (EQ: P9-P12 and CDS: P21-P24). The resulting double-sorted equally-weighted equities and CDS portfolios are regressed on the four standard risk factors (Crd, Term, TED, and Mkt), described in Table A2. We then perform the PCA analysis on standardized risk-adjusted excess returns, i.e. the standardized residuals from the first-pass regressions. PC loadings for the first-three PCs ($\widehat{\boldsymbol{w}}_j$, for j=1,2,3) are displayed in the top charts, which contain the same information of Fig. 3. Left panels (EQ. Port.) present the loadings associated with the equity portfolios (P1-P12), whereas right panels (CDS Port.) those with the CDS portfolios (P13-P24). The double-sorted portfolios (P1-P24) are denoted by LL, LH, HL, HH, where the first letter denotes the level of the first sorting variable (S1: bank risk) and the second letter that of the second sorting variable (S2: Dep2GDP). We then present the cumulative sum of the PCs in the mid charts, and the cumulative sum of the return factors, i.e. portfolios excess returns times the PC weights ($R[PC_j]_t = \boldsymbol{xr}_t\widehat{\boldsymbol{w}}_j'$), in the bottom charts. The sample includes all banks and spans the period 2004–2018 at a daily frequency.

Fig. A3. Equity EGS factor: 2000-2018



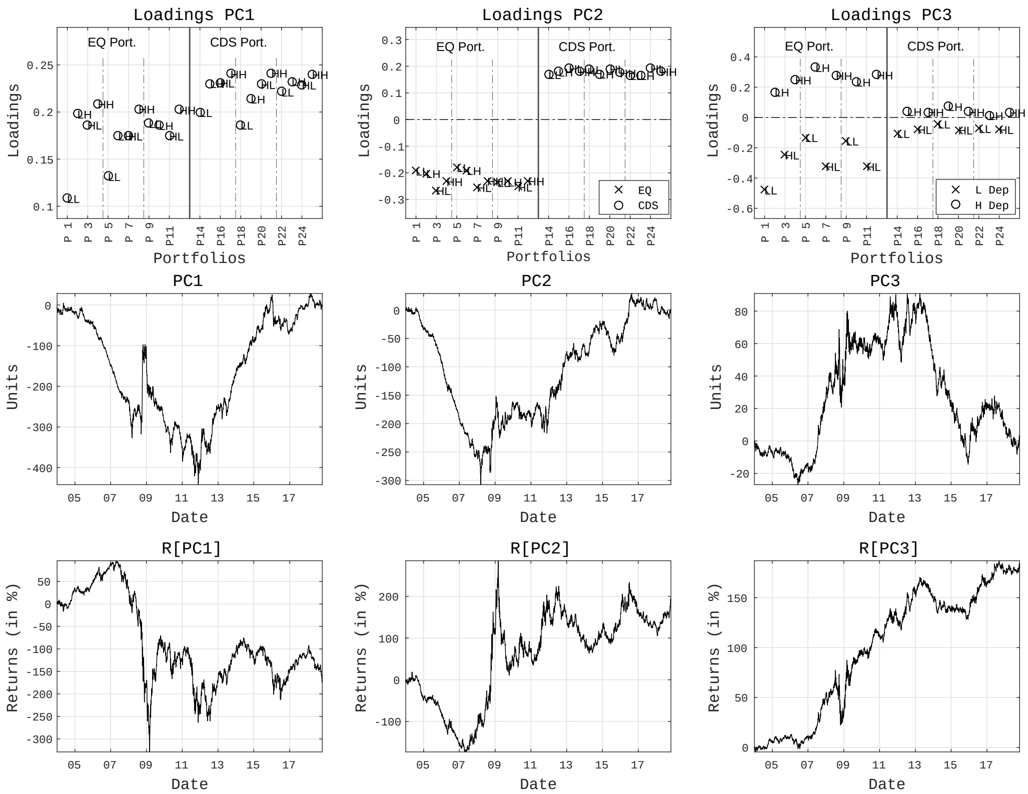
Note: The figure shows the principal component analysis (PCA) of the risk-adjusted equity excess returns of the double-sorted portfolios. Banks are first sorted on bank risk (low, high), and then on deposits to GDP (low, high), our proxy for the expected government support. Portfolios are rebalanced at a monthly frequency. We use three measures of bank risk: bank book leverage (P1-P4), equity volatility (P5-P8), and deposits to total assets (P9-P12). The resulting double-sorted equally-weighted equities and CDS portfolios are regressed on the four standard risk factors (Crd, Term, TED, and Mkt), described in Table A2. We then perform the PCA analysis on standardized risk-adjusted excess returns, i.e. the standardized residuals from the first-pass regressions. PC loadings for the first-three PCs ($\widehat{\boldsymbol{w}}_j$, for j=1,2,3) are displayed in the top charts. The double-sorted portfolios (P1-P12) are denoted by LL, LH, HL, HH, where the first letter denotes the level of the first sorting variable (S1: bank risk) and the second letter that of the second sorting variable (S2: Dep2GDP). We then present the cumulative PCs in the mid charts, and the cumulative portfolios excess returns times the PC weights ($R[PC_j]_t = \boldsymbol{xr}_t\widehat{\boldsymbol{w}}'_j$) in the bottom charts. The sample includes all banks for which equity data are available and spans the period 1/2000–11/2018 at a daily frequency.

Fig. A4. Rating uplifts over time



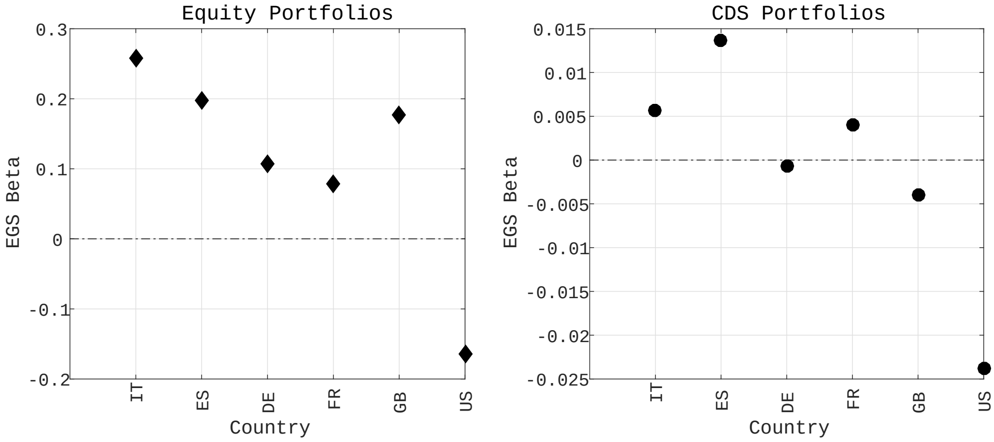
Note: The figure presents an alternative measure of the expected government support, the so-called rating uplift. This measure is computed as the difference between the bank all-in-all credit rating, i.e. the bank ability to repay it deposit obligations, measured using Moody's foreign-currency deposit ratings, and the stand-alone credit rating, i.e. the bank intrinsic safety and soundness, measured using Moody's bank financial strength (BFS), or bank credit assessment, ratings. Deposit ratings are converted into the BFS scale, and then into a numerical scale 1 (E) to 13 (A). The difference between the two types of rating gives the uplift. Top panel shows the cross-sectional averages across banks, while bottom panel denotes the number of uplift increases and decreases over time. The period is 1/2000–11/2018 and the sample includes all banks.

Fig. A5. Level, security, and EGS factors robustness: additional risk factors



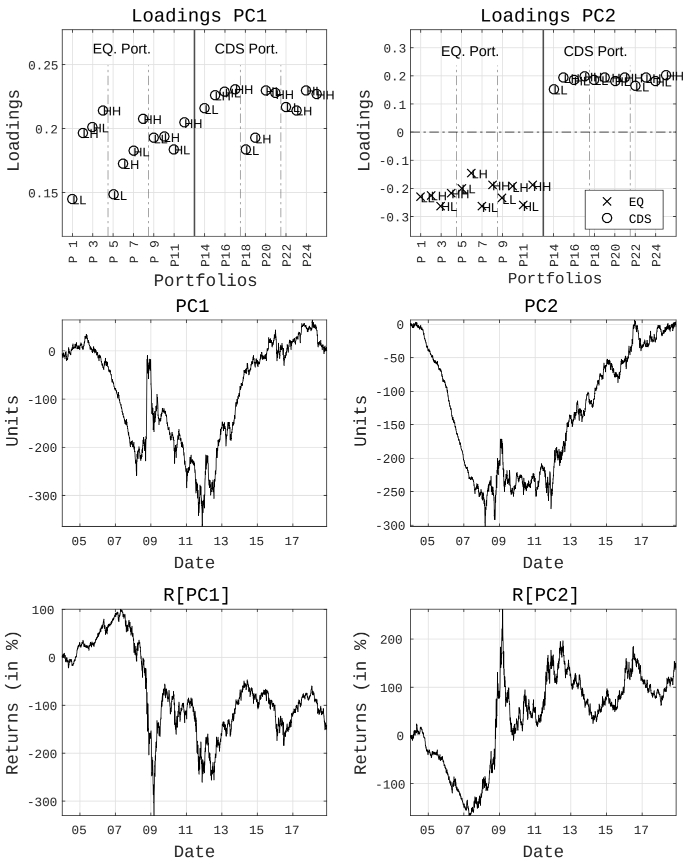
Note: The figure shows the joint principal component analysis (PCA) of the risk-adjusted equity and CDS excess returns of the double-sorted portfolios using the seven-factor SDF described in the Internet Appendix (Table A8). Banks are first sorted on bank risk (low, high), and then on the deposits to GDP (low, high), our proxy for the expected government support. Portfolios are rebalanced at a monthly frequency. We use three measures of bank risk: bank book leverage (EQ: P1-P4 and CDS: P13-P16), equity volatility estimated over a three-month rolling windows (EQ: P5-P8 and CDS: P17-P20), and deposits to total assets (EQ: P9-P12 and CDS: P21-P24). The resulting double-sorted equally-weighted equities and CDS portfolios are regressed on the four standard risk factors, as well as the three global Fama-French factors, described in Table A2. We then perform the PCA analysis on standardized risk-adjusted excess returns, i.e. the standardized residuals from the first-pass regressions of Table A8. PC loadings for the first-three PCs ($\widehat{\boldsymbol{w}}_j$, for j=1,2,3) are displayed in the top charts, which contain the same type of information of Fig. 3. Left panels (EQ. Port.) present the loadings associated with the equity portfolios (P1-P12), whereas right panels (CDS Port.) those with the CDS portfolios (P13-P24). The double-sorted portfolios (P1-P24) are denoted by LL, LH, HL, HH, where the first letter denotes the level of the first sorting variable (S1: bank risk) and the second letter that of the second sorting variable (S2: Dep2GDP). We then present the cumulative sum of the PCs in the mid charts, and the cumulative sum of the return factors, i.e. portfolios excess returns times the PC weights ($R[PC_j]_t = \boldsymbol{xr}_t\widehat{\boldsymbol{w}}'_j$), in the bottom charts. The sample covers all banks and spans the period 01/2004–10/2018 at a daily frequency.

Fig. A6. Country EGS betas



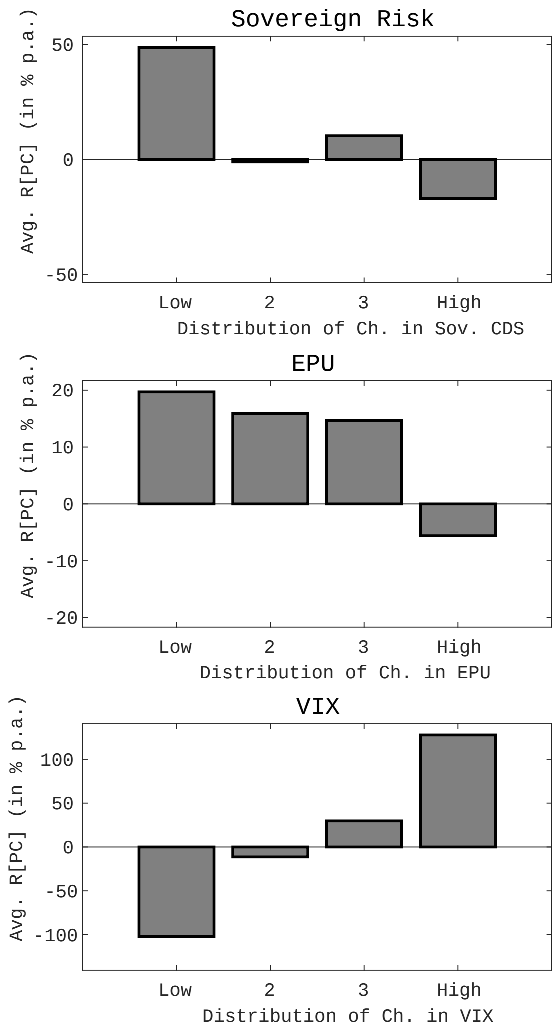
Note: The figure shows the estimated exposures (*betas*) of country spread portfolios to the expected government support (EGS) factor, controlling for the standard risk factors. For a given country, banks are first grouped into the high and low portfolios according to their deposits, and then the spread portfolio is obtained as the difference between the high and low portfolios. The EGS factor, resulting from the joint PC analysis of double-sorted equity and CDS bank risk-adjusted excess returns, is long in high deposit-to-GDP banks and short in low deposit-to-GDP banks (see Fig. A2). Left panel shows the EGS *betas* for equity portfolios, while right panel for CDS portfolios. We include those countries for which a sufficient number of banks is available. The period is 1/2004–11/2018.

Fig. A7. Level, security, and EGS factors robustness: excluding subsidiaries



Note: The figure shows the joint principal component analysis (PCA) of the risk-adjusted equity and CDS excess returns of the double-sorted portfolios. Banks are first sorted on bank risk (low, high), and then on the deposits to GDP (low, high), our proxy for the expected government support. Portfolios are rebalanced at a monthly frequency. We use three measures of bank risk: bank book leverage (EQ: P1-P4 and CDS: P13-P16), equity volatility estimated over a three-month rolling windows (EQ: P5-P8 and CDS: P17-P20), and deposits to total assets (EQ: P9-P12 and CDS: P21-P24). The resulting double-sorted equally-weighted equities and CDS portfolios are regressed on the four standard risk factors (Crd, Term, TED, and Mkt), described in Table A2. We then perform the PCA analysis on standardized risk-adjusted excess returns, i.e. the standardized residuals from the first-pass regressions. PC loadings for the first-three PCs ($\widehat{\boldsymbol{w}}_j$, for j=1,2,3) are displayed in the top charts, which contain the same information of Fig. 3. Left panels (EQ. Port.) present the loadings associated with the equity portfolios (P1-P12), whereas right panels (CDS Port.) those with the CDS portfolios (P13-P24). The double-sorted portfolios (P1-P24) are denoted by LL, LH, HL, HH, where the first letter denotes the level of the first sorting variable (S1: bank risk) and the second letter that of the second sorting variable (S2: Dep2GDP). We then present the cumulative sum of the PCs in the mid charts, and the cumulative sum of the return factors, i.e. portfolios excess returns times the PC weights ($R[PC_j]_t = \boldsymbol{xr}_t \widehat{\boldsymbol{w}}_j'$), in the bottom charts. The sample excludes subsidiaries (as defined in Table A1) from the all banks sample, and spans the period 2004–2018 at a daily frequency.

Fig. A8. EGS factor, sovereign risk, economic policy uncertainty, and VIX



Note: The figure shows, in the left panel, mean excess returns for the expected government support (EGS) factor ($R[PC_3]_t = \boldsymbol{xr}_t \widehat{\boldsymbol{w}}_3'$) conditional on the Economic Policy Uncertainty (EPU) Index (left panel), sovereign risk (mid panel), and VIX (right panel) innovations, i.e. changes, being within the lowest and highest quartile of their sample distributions (four categories from lowest to highest shown on the x-axis of each panel). The EGS factor, resulting from the joint PC analysis of double-sorted equity and CDS bank risk-adjusted excess returns, is long in high deposit-to-GDP banks and short in low deposit-to-GDP banks. Sovereign risk is measured as the mean of developed countries' 5-year CDSs. VIX is the CBOE Volatility Index. The daily EPU Index quantifies newspaper coverage of policy-related economic uncertainty (see www.policyuncertainty.com). The sample includes the developed country banks and spans the period 01/2004–11/2018 at a daily frequency.