European Safe Bonds (ESBies)[i]

The euro-nomics group[*]

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1. Introduction

The European Union today faces one of the greatest challenges in its existence. The euro-zone, which just at the start of this century was lauded as Europe's great unifying achievement, has given way to states on the verge of default, financial systems that seem as solid as a deck of cards, and a great deal of disappointment with the European institutions. There are many reasons for this state of affairs, most of which fall within the realm of economics. One factor, that is crucial but under-appreciated is that Europe's problems are a consequence of a much wider, world, problem: the lack of safe assets. As a long-term trend, the impressive growth in the developing world during the last two decades has increased the demand for safe assets, as those countries' economic development outpaces their financial development yet they already need to build up reserves to smooth future shocks. As a short-term phenomenon, but one that is here to stay, the financial crisis of 2007-08 showed that financial markets can go through periods of tremendous volatility that have investors plunging towards an asset that is deemed safe.[ii]

Modern financial systems rely heavily on safe assets. At the foundation of even the most complex financial securities there is usually a requirement to post as collateral some asset that is deemed safe by the parties involved. Prudent bank regulation, following Basel in its many rounds, requires banks to manage the risk in their assets in proportion to their capital. As a result, a substantial part of any bank's balance sheet must be in safe assets, as defined by the financial regulators. Pension funds are another example of a large class of investors that must hold a significant amount of safe

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assets, and even the least risk-averse of investors needs, even if only temporarily, to park investments in a safe vehicle. Finally, in conducting conventional monetary policy, the central bank should exchange money for safe bonds.

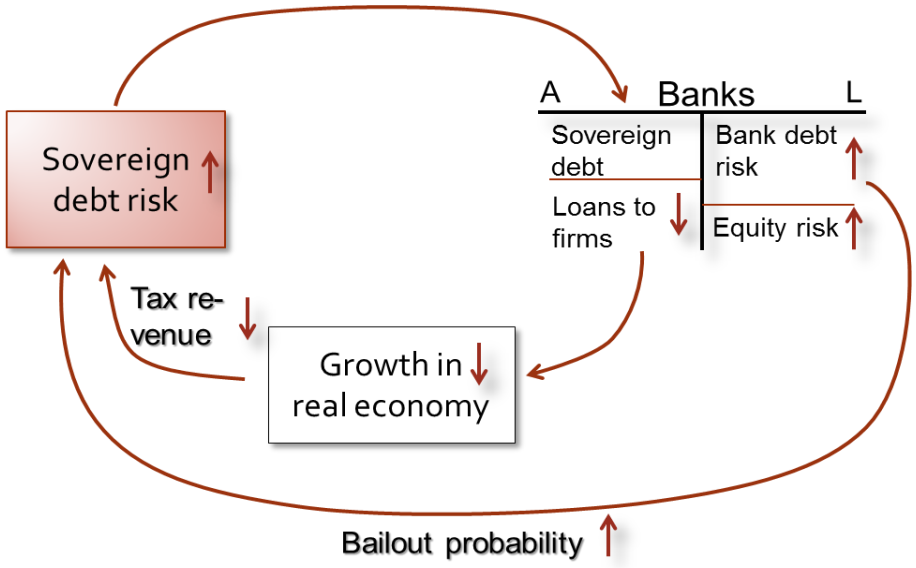
A safe asset for all of these purposes is one that is liquid, that has minimal risk of default, and that is denominated in a currency with a stable purchasing power. To meet the large demand we just described, there is very little supply of assets satisfying these three characteristics. As a result, the most used of them, the U.S. Treasury bills and bonds, earn a large "safe haven" premium of as much as 0.7% per year.[iii] Europe, in spite of the size of its economy and its developed financial markets, and in spite of being home to one of the worlds' reserve currencies, does not supply a safe asset that rivals U.S. Treasuries. This has been noted before. What is less appreciated is that this deficiency is at the heart of the current European crisis.

In the absence of a European safe asset, bank regulators, policymakers, and investors have treated the bonds of all of the sovereign states in the euro-area as safe for the last 12 years. Bank regulators following the Basel criteria give sovereign bonds held by national banks a riskless assessment in calculating capital requirements, even as insuring against the default of some sovereign bonds using credit default swaps costs more than 5% today. The stress tests of European banks rule out, by assumption, the likely default in some of the sovereign assets held by the banks, making it difficult for investors to trust them. European policymakers have treated Greek and Dutch bonds as identically safe, even though they have traded at widely different prices in the market. The ECB accepts sovereign bonds of all its member states in its discounting operations, and while it applies different haircuts to them, they have been generous towards the riskier sovereigns. In turn, national policymakers have persuaded national banks to hold larger amounts of local national debt than prudent diversification would suggest. Finally, investors have been fervently speculating on whether sovereign states will be bailed out or not by their European partners, alternating between seeing the bonds as all equally safe, or seeing some of them as hopelessly doomed.

This situation led to two severe problems. First it created a diabolic loop, illustrated in Figure 1. Encouraged by the absence of any regulatory discrimination among bonds, European banks hold too much of their national debts, which, far from being safe, instead feeds never-ending speculation on the solvency of the banks. Sovereigns, in turn, face a constant risk of having to rescue their banks, which, combined with the uncertainty on what fiscal support they will receive from their European partners, increases the riskiness of their bonds. Finally, European policymakers lack the institutions and own

resources to intervene in all of the troubled sovereign debt markets. The ECB ends up holding the riskiest of the sovereign bonds as the ECB becomes the sole source of financing for the troubled banks.

Figure 1: Diabolic loop between sovereign debt risk and banking debt risk.



Breaking this loop, and giving the euro-zone a chance to survive in the long run, requires creating a European safe asset that banks can hold without being exposed to sovereign risk. However, contrary to what is widely believed, this does not require creating Eurobonds, backed in solidarity by all the European states and their taxing power. Many Europeans are not willing to accept the fiscal integration required by Eurobonds. Moreover, without essential control mechanisms on national public accounts, hastily introduced Eurobonds may lead to a much larger debt crisis in a few years, from which there is no way back. We offer an alternative that creates a safe asset, while eliminating these problems with Eurobonds.

The second severe problem is that, in the absence of a European safe bond, the bonds of some sovereigns at Europe's center have satisfied the demand for safe assets. In times of crisis, capital flows from the periphery to the center; in boom phases, capital flows from the periphery to the center. These alternating capital flows between searching for "yield" and searching for "safe haven", generate large capital account imbalances in the Euro area, with associated changes in relative prices and potential disruptions in asset markets.[iv]

Our proposal is to create European Safe Bonds (ESB), which we will refer to as **ESBies** for short.[v] They are *European,* issued by a European Debt Agency in accord with existing European Treaties, and do

not require more fiscal integration than the one we already have. They are *Safe*, by virtue of being designed to minimize the risk of default, being issued in euros and benefitting from the ECB's anti-inflation commitment, and being liquid as they are issued in large volumes and serve as safe haven for investors seeking a negative correlation with other yields. They are *Bonds*, freely traded in markets, and held by banks, investors and central banks to satisfy the demand that we described.

Combined with appropriate regulation that gives the correct risk weights to sovereign bonds, ESBies could solve the two problems that we just described. Banks would have an alternative to sovereign bonds, allowing them to become better diversified and less dependent on their country' public finances. Moreover, the flight of capital to a "safe haven" would no longer be across borders, but across different financial instruments issued at the European level.

This document lays down the details of how ESBies work. The next section explains the proposal. Section 3 lists the main benefits that ESBies would bring. Section 4 to 6 go deeper into the nuts and bolts of ESBies explaining, in turn, how their composition is determined, how their safety is ensured, and how they would be issued. Section 7 compares our proposal with alternatives, the leading one being Eurobonds. Section 8 briefly concludes.

2. ESBies: their structure and use

In one sentence, ESBies are securities issued by a European Debt Agency (EDA) composed of the senior tranche on a portfolio of sovereign bonds issued by European states, held by that agency and potentially further guaranteed through a credit enhancement.

In more detail, our proposal is for the EDA to buy the sovereign bonds of member nations according to some fixed weights. The weights would be set by a strict rule, to represent the relative size of the different member States. There would be no room to change the weights by discretion to respond to any crises, perceived or real. Therefore, the EDA cannot bail out a nation having difficulties placing its sovereign debt. It would typically run a boring business that does not make the headlines: It would simply passively hold sovereign bonds as assets in its balance sheet, and use them as collateral to issue two securities.

The first security, ESBies, would grant the right to a senior claim to the payments from the bonds held in the portfolio. If the tranching cut-off is X%, then the first X% lost in the pool of bonds because of potential European sovereign defaults would have no effect on the payment of the ESBies.

The remaining 1-X% of revenues from holding the bonds would go to the holders of the ESBies. The number X% is relatively large, so that even in a worst-case scenario (e.g. a partial default by Greece, Portugal and Ireland and a haircut on Italian and Spanish debt), the payment on the ESBies would not be jeopardized. On top of it, the EDA, using some initial capital paid in by the member states, would offer a further guarantee on the payment of Y% of the ESBies, so that it would take losses of more than Y+X% before the ESBies did not offer a perfectly safe payment in euros to its holders. As long as this sum was picked adequately, the ESBies would be effectively safe. European banks, pension funds and the ECB would be a natural starting clientele for the ESBies, but as their reputation grows, they could be as widely used as US Treasuries are used today all over the world. They could also be used as reserve currency assets by countries such as China, Brazil, the OPEC, etc.

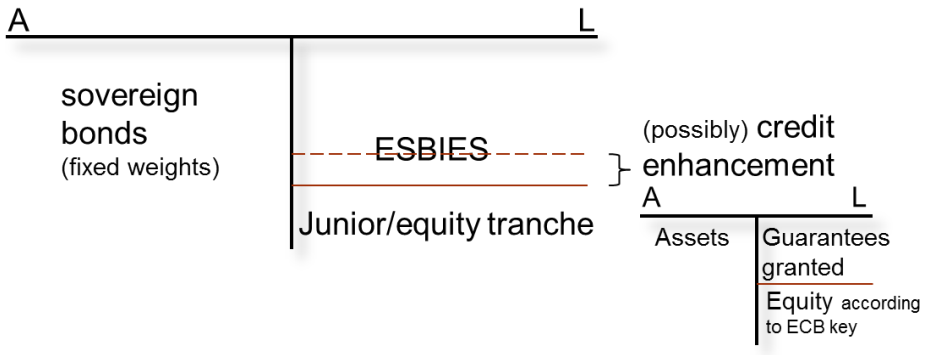
The second security, composed of the junior tranche on the portfolio of bonds, would be sold to willing investors in the market. In contrast with the ESBies, this is a risky security, akin to an equity claim on the EDA (but obviously without control rights). Any risk that a sovereign state may fail to honor in full its debts would be reflected in the expected return on this security. Any realized losses would be absorbed by the holders of this junior security, and not by the EDA nor the European Union nor its member States. Investors that want to hedge (or even speculate) on the ability of European member states to repay their debt would be willing to hold and trade this security.

Beyond being correctly designed and issued, the success of the ESBies depends on two regulatory changes. First, the ECB would grant strict preferential treatment to ESBies, accepting them as its main form of collateral in repo and discounting operations. In effect, the ECB would still be holding sovereign bonds as assets, but now indirectly via the ESBies; and, importantly, it would only hold the safest component of these sovereign bonds. Because of the fixed weights in the ESBies, this would be consistent with conventional monetary policy, where open market operations trade money for safe ESBies without creating credit risk for the ECB and ensuring it has a safe balance sheet. Second, banking regulators, including Basel, would give a zero risk weight to ESBies, but not automatically to other sovereign bonds. The new risk weights for European sovereign bonds will reflect their default risk just as risk weights reflect the risk on banks' holdings of other assets such as corporate bonds or corporate loans.

Figure 2 summarizes the details in this description. There are three parts of the proposal that require further explanation: how to set the weights in the portfolio of sovereign bonds? How to choose the size of the ESBies relative to the junior tranche and the credit enhancement? And how would the

EDA operate day-to-day? These are explained in more detail in sections 4 to 6. But, before discussing the details in more depth, we summarize the virtues of the proposal.

Figure 2: Graphical representation of tranching with possible credit enhancement.



3. What do the ESBies achieve?

Our proposal has two complementary elements: changing bank regulation and ECB policy to reflect the risk of sovereign bonds, and supplying a large amount of a euro-wide bond that is as close as possible to being risk-free. Some benefits of our proposal stem from the first elements, some from the second, and some from the interaction of the two.

Starting with the change in bank regulation, appropriate Basel risk weights and ECB haircuts to sovereign bonds would eliminate the present mispricing of European sovereign bonds. Currently, the riskiest sovereign bonds have artificially high prices (low yields) for at least three reasons. First, because the risk weights according to Basel are zero for all sovereign bonds held by national banks, favoring holding these bonds relative to other risky investments. Second, because in boom phases, banks expect they will be able to pass to the ECB sovereign bonds at generous haircuts during crisis phases. Third, because the contagion provoked by the diabolic loop between sovereigns and banks spreads across borders, creating the expectation that a country will be bailed out by the other European countries. The regulatory changes that we propose would remove these distortions and lead to the correct pricing of the risk associated with sovereign bonds.

This change in regulation would only be fully effective without creating problems of its own if banks had an alternative safe asset to hold. Otherwise, banks would hold the safest European national

bonds (e.g., German), amplifying the diabolic country for that particular country and letting adverse shocks to that country's solvency have a disproportionately large effect on the entire European banking system. This leads to the second benefit from our proposal that comes from jointly changing bank regulation and introducing safe bonds: the shift of bank portfolios from risky sovereign debt to safe ESBies. Banks would still be able to hold national bonds, but only against the appropriate regulatory capital that reflects their risk. Together with the correct pricing of these bonds, this would make it less likely that European banks would risk holding on to a substantial investment for as long as they have on Greek bonds.[vi] In turn, ESBies would satisfy the demand for safe assets from banks moving away from sovereign bonds. Because ESBies give a claim to the safest portion of the cash flow generated by a well-diversified portfolio of bonds, banks could avoid the overexposure to national bonds that is at the heart of the diabolic loop between sovereign and banking crises.

Third, the existence of ESBies creates a benefit by itself, independent of banking regulation. The EDA would capture some of the "safe haven" premium that investors are willing to pay in exchange for the safety and liquidity of this asset. Currently, Germany obtains some of this premium in tis sovereign bonds, but ESBies would be beneficial on two accounts. First, the extra safety of the ESBies relative to bunds, and the extra liquidity from pooling across European sovereigns, would greatly increase the "safe haven" premium. If the premium were as large as it is for U.S. Treasuries, then the revenues generated by issuing ESBies would be comparable to the revenues that Euro-area countries have obtained in seignorage from the euro. Second, this premium would now be shared with other countries that are as safe but not as liquid, like Austria, Finland, and the Netherlands, and with countries that are not safe at all, like Greece, Ireland, Italy, Portugal and Spain.

A fourth benefit from the ESBies comes from addressing the second problem of the current status quo: the large capital flow imbalances due to the search for "safe haven". The "flight to quality" would now be a shift out of the junior tranche and into the ESBies, rather than out of one European region and into another. This would stabilize portfolios for sovereign debt, and reduce the sudden reversals of capital flows across Europe and their associated relative-price distortions. With ESBies, the flight to safety across regions is replaced by a flight to safety across tranches.

Fifth, the ECB would benefit by conducting open market operations with ESBies. Conventional monetary policy requires that money be traded for bonds that are safe, and the ESBies would be the closest there is to such an asset. It would still be possible for the ECB to conduct unconventional monetary policy, via "credit policy", in the sense of trading ESBies for other riskier securities. For

instance, the ECB could still accept sovereign bonds themselves as collateral, or even the junior tranches of the EDA structure, albeit at large haircuts that properly reflect the risk of these securities. But this would be a policy tool, to use in unconventional times, rather than an inevitable consequence of banks wanting to discount the riskiest bonds at the ECB as they do today.

Sixth, in no part of the proposal does the taxing power of a sovereign over its citizens play a role. The safety of the ESBies is achieved by the triple virtues of diversification, tranching, and credit enhancement. It does not rely on any particular government to extract resources by taxation. Related, there are no fiscal transfers between regions of Europe as a result of the ESBies. Indeed, although ESBies would provide some relief from the sovereign debt woes of Euro-area countries, the EDA will generally buy an amount of sovereign bonds that is well below the total amount issued by the government. As a result, the marginal bond issued would still have to be placed in the private market and be correctly priced. National governments would thus receive the right signals from market prices to provide them the right incentives in managing their public finances.

A seventh, related, advantage is that this proposal requires, to our knowledge, no change to European Treaties. Nothing in the Treaties forbids the creation of ESBies, and the EDA's mission would fall into the broad mandate that was given to the EFSF. The bank regulation revision favoring ESBies would come naturally in a fast-tracked revision of the Basel standards. Finally, the charters of the ECB could be easily modified to encourage it to buy ESBies and stop having to accept all sovereign bonds of member states without violating the spirit of the European Treaties. This is in contrast to Eurobonds, which involve a complicated, multi-year, treaty amendment process.

A final advantage is that, since ESBies would be issued at different maturities, they would generate as a by-product, data on the euro risk-free yield curve. This would be a valuable input for monetary policy and for investors' risk management that is currently missing in Europe.

The list of all of these virtues may at first seem almost magical. On second thought, it leads to a pertinent question: why hasn't a private bank done the pooling and tranching of sovereign bonds and issued ESBies a long time ago? Answering this question provides an answer to a related important question: how can value be created by just re-packaging bonds? The answer to these questions is that eliminating the distortions brought about by bad regulation creates value. As we discussed earlier, the bank regulation practices of accepting national sovereign bonds as riskless for capital requirements, together with the ECB's generous haircuts, leads to a mispricing of sovereign bonds. By a government effort, this can be eliminated by directing the ECB interventions and the bank regulation risk weights

towards ESBies. Value is thus created by moving to a different equilibrium, one that is supported by a pricing mechanism truly reflective of underlying risks. A private entity could not convince the ECB and the regulators to change their procedures in this way.

A related question is: what if one were to only remove the regulatory distortions in the market for Euro-area sovereign debt, and dispense with ESBies? Several of the advantages above, like the capture of the "safe haven" premium or the attenuation of capital flow imbalances, require ESBies. Moreover, we are doubtful that private financial institutions would create ESBies spontaneously. It is not easy to introduce a large-scale, highly-standardized, issuance program as required by. Private investors may not have the deep pockets to supply a credible credit, the commitment to keep the program going while buyers get used to the new bonds and contracts, or the incentives to be transparent and maximize the safety of the ESBies and its social benefits. A public issuer like the EDA may be more adequate.

4. How to choose the portfolio weights in the EDA's assets?

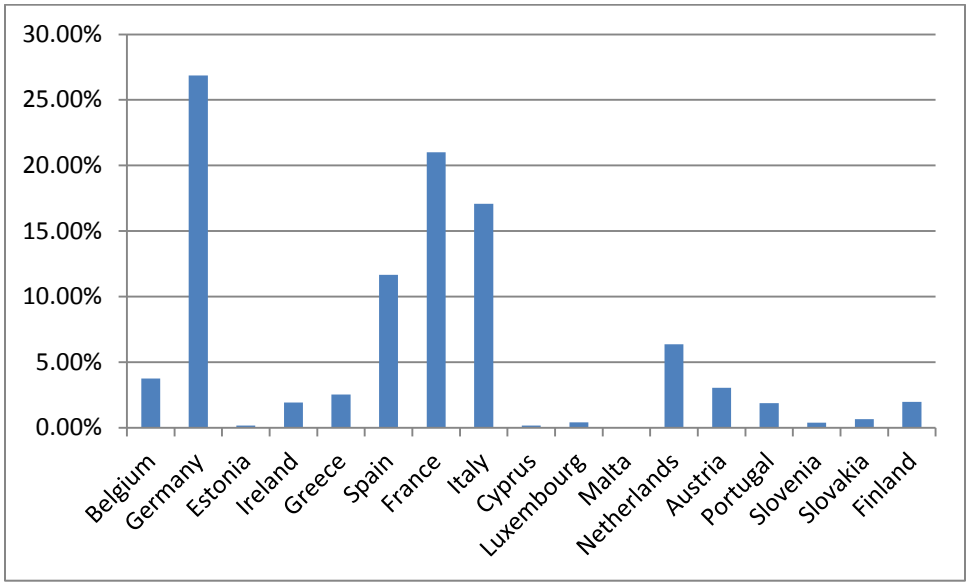
The ESBies are backed by collateral in the form of a pool of the sovereign bonds of the 17 countries that are members of the Eurozone. A few principles must be followed in the process of picking the amount of each sovereign bond to buy.

The most important principle is that the portfolio choice should be guided by a strict, stable, credible, and transparent rule. The rule should be formulaic and unambiguous, and therefore immune to political interference. Any change should require parliamentary approval and be hard and slow to make. Finally, the rules should also be included in the ESBies contract, so that private holders of the security would have the legal right to demand compensation from the European authorities if the rules were broken, thus endangering the safety of the ESBies.

All of these safeguards may seem extreme, but they are inevitable given the events of the past year. In a crisis, there will always be a great temptation for politicians to ask the EDA to increase its bond holdings of a country in distress. Even if this request may seem morally correct, it would undermine the ability of the ESBies to provide a safe security. There are other means by which the European Union may transfer resources to some of its members in need; that is not the function of the ESBies.

We propose that the weights of each bond are equal to the average weight of its sovereign's GDP in overall Eurozone GDP, averaged over the previous 5 years. Figure 3 shows the weights in the collateral pool of ESBies issued today.

Figure 3: Country weights in the ESBies



This rule is easy to implement and to verify, making its surveillance feasible. It rewards countries that grow faster than average, but only gradually, and the slow-moving weights make sure that ESBies of successive vintages are roughly similar. The dependence is on average past, not present, GDP for two reasons. First, since this avoids a scenario in which a country suffers a terrible shock this year, falls into a recession that requires it to borrow abroad, and finds the EDA having to reduce its holdings of the country's bonds, potentially deepening the crisis. Second, as final GDP numbers are typically only known with some delay, it ensures that governments are not tempted to inflate their provisional estimates of GDP to trick the EDA into buying their bonds.

It is worth discussing two alternatives. The first would be to follow the same weights used by the ECB to determine the allocation of seignorage, and which are based on measures of the amount of money in circulation in each member state. The virtue of this alternative rule is that it is already in use and it has generally proven to be resilient to outside political pressure. Its shortcoming is that a country going through a credit boom will tend to see its measures of broad money rising quickly. Having the EDA buy more of the sovereign bonds in these countries may exacerbate the run up in debt in that country.

The other alternative would be to have the weights adjust to measures of risk of each sovereign bond. A benefit of this scheme is that the weights in the portfolio backing the ESBies would serve as an extra mechanism ensuring their safety. There is an important objection, however. If a country's perceived risk increases, this would trigger sales of its bonds by the EDA, raising interest rates and at least partly confirming the initial belief. This leaves room for multiple equilibrium to arise or, more

generally, for the EDA's management of its portfolio to amplify shocks in the individual sovereign debt markets. In addition, the risk of a sovereign bond is more difficult to measure and hence can be manipulated.

5. What makes the ESBies safe?

Three features of the ESBies ensure their safety: diversification or pooling, tranching and the credit enhancement. We explain each in turn in this section.

By pooling together different bonds, it becomes less likely that all of them default at the same time. Therefore, at any given date, the expected size of the losses in the overall pool is lower. We have conducted some simulations to determine how large this benefit would be. They are available in the appendix; here we briefly describe their main assumptions and the resulting estimates.

We consider three possible scenarios facing European sovereign bonds. In the first one there is a catastrophe where all countries in the Euro area have a higher likelihood of default than there has been implicit in prices in the last 20 years, and default in the periphery countries is almost certain. In the second scenario, there is low default risk for all countries except Greece, which is almost sure to default. Finally, the third scenario captures normal times, where conservatively, we assign default probabilities according to each country's current credit rating according to Moody's and S&P. We further assume that the recovery rate to the bondholders is lower in the worse states, and that if some of the larger countries defaults, this will precipitate an almost sure default in their neighboring countries.

Altogether, these assumptions ensure that there is a very large degree of commonality in defaults across the Euro-area. This is likely unrealistic, but in times of crisis, correlations increase quickly, so it is important to be conservative. We then consider two possibilities for assigning probabilities to each of the three scenarios, and to the expected default and recovery rates. In one case, we use the historical data on sovereign bonds between 1983 and 2007. In the second one, we enforce a much more pessimistic outlook on the world to get something closer to a lower bound on the amount of diversification that pooling all of the bonds into the ESBies can achieve. All of these calculations are imperfect and should be seen as a first pass on the problem to provide some rough quantitative guidance of what is at stake.

Under the pessimistic scenario, a simulation of the model predicts that the pool of sovereign bonds will lose 30% of its value with a probability of only 0.80% for every 5-year period. That is, only

once every 600 years would the EDA not be able to pay entirely a senior claim on its portfolio of bonds. With the historical-data scenario instead, losses would exceed 30% only 0.11% of the times and they will exceed 20% only 0.50% of the times. Pooling and diversification make ESBies safer than every European sovereign bond in both scenarios.

This leads to the second element that makes ESBies safe. Because they are the senior tranche on the bond portfolio, they are the first to get paid from the revenue of the bonds. Therefore, if the tranching cut-off is 20%, under the historical data the ESBies would deliver a loss only once every 1000 years, while under the pessimistic scenario, the ESBies will pay for sure every 600 years with a 30% tranching threshold. Combining pooling with tranching, ESBies would be considerably safer than German bunds.

We do not want to suggest that this number is the final word. Policymakers can (and should) do more sophisticated calculations considering many alternative scenarios for defaults in the Eurozone to see their implication for the safety of the ESBies. The choice is then how to trade-off keeping the tranching cut-off as low as possible to increase the supply of ESBies for a particular portfolio of bonds, while keeping it as high as possible to keep the default risk on the ESBies low enough to keep them safe.

The safety of the ESBies relies in great part on the riskiness of the junior tranche. We expect that hedge funds, pensions funds and other investors would be willing to hold these securities, at the right price. While an investor can today already buy a portfolio of sovereign bonds, if it wants to leverage this, it must do so on margins that can change every day and induce costly margin calls. The junior tranche instead provides and embedded leverage that is fixed over time. Therefore, an investor today that wants to be exposed to Irish sovereign credit risk can do so indirectly using the junior tranche of the ESBies, without having to borrow and so without committing as many resources. For the radically pessimistic and risk-averse person, we propose a third layer of protection for the ESBies: a capital guarantee. If the losses upon default were to ever exceed the size of the junior tranche, another entity would step in and cover the losses on the outstanding ESBies, with some limit. To be more concrete, the members of the Eurozone could pay in some capital upfront and, in case the default losses exceed the 30% tranching cut-off, these assets would absorb the losses until being exhausted. This guarantee would add to the safety and desirability of the bonds. Since it is effectively catastrophic risk insurance, it would only result bind in the very worst states of the world.

How large would this capital guarantee be? In the worst case scenario, where we use our pessimistic parameters, and assume that the EDA purchases 60% of the euro-area's GDP in sovereign

bonds issuing the highest possible amount of ESBies, then €800 billion would lower the probability of any loss in the ESBies to 0.2% in every 5-year period. With the historical parameters, a capital guarantee could be much more modest because the first 99.88% of losses would be borne by the junior tranche holders.

The credit enhancement is best provided by a public entity rather than a private source for two reasons. First, if the guarantee were to be provided by a private market party, that party would automatically be too-big-to-fail. The tail risk insurance provided by the guarantee would be hard to price in the private market because of the underlying possibility of a bailout by the authorities. Second, adjusting the size of the capital guarantee vis-a-vis the size of the ESBies tranche gives the power to trade-off the costs of the guarantee in terms of extra protection against the liquidity benefits of being able to issue a larger amount of ESBies. Safety and liquidity are two public benefits of issuing ESBies, that are probably best internalized within public institutions.

The EFSF, created to respond to the current crisis, would be a suitable vehicle to provide this capital guarantee. That is, in the very unlikely event that a spate of defaults across Europe lead to losses above the tranching threshold, the EDA would have the right to call on the EFSF to take up to a certain amount of the losses. Recalling that European countries have already committed €440 billion to the EFSF, this may be feasible. Ideally, the assets would be parked in this vehicle, perhaps using the gold reserves of the countries.[vii]

Finally, to conclude, it is important to reinforce two points. First, that while the ESBies try to be as safe as possible, not all default risk has been eliminated. European governments will under no circumstance bail out the holders of the ESBies were they to suffer losses after the capital guarantee is exhausted. Second, there is no guarantee whatsoever for the junior tranches. They absorb the first X% of losses when there is a sovereign default in full. Again, in no circumstance would the private market investors holding these tranches (hedge funds, pension funds, etc.), be compensated in case of losses. Unlike the ESBies, these are risky securities.

6. How would the ESBies be issued?

Beyond the overall structure of the ESBies, there are several implementation features that are worthy of some discussion. We will discuss three topics: the set-up of the EDA and size of the program, the maturities and different vintages of the ESBies, and the gradual introduction of the ESBies into the

Euro-zone. Many readers may find what follows, on the nuts and bolts of how the EDA would operate, somewhat technical and may wish to jump to the next section.

6.1 Forming the EDA and limiting the amount of ESBies in circulation

The EDA would play an important role in the European financial system. The amounts at stake would be large, and there are many savvy speculators willing to exploit any mistakes the EDA makes. Therefore, the agency would need a technically competent staff and an independent and knowledgeable board of directors. We do not anticipate that it would be hard to fulfill these requirements. For starters, almost every developed country has an agency in charge of issuing and managing its public debt, so there is some closely related experience on how to manage these institutions. Moreover, there already is a sizable European bureaucracy with decades of experience on how to keep its independence and a close cousin in the ECB. The EDA would require a much smaller staff than the ECB, making it easier to find the right people.

The governance of the EDA would have to be carefully set up to ensure it is immune from political pressure, be it from European or national institutions. One source of pressure would be to increase the share of a country "in need" in the portfolio of bonds held by the EDA. Because our rule for setting weights based on average GDP over the past 5 years is very transparent and rigid, it would be hard to do this under-handedly. Moreover, as we have already discussed, this would be written into the covenants of the ESBies bond contract, so that market participants would have the incentive to supervise the actions of the EDA and proceed to the courts if they were not consistent with keeping the ESBies safe.

A second source of temptation would be to increase the amount of ESBies issued, both as a trend over time and especially during recessions. One important feature that must be part of the debt covenants is a ceiling for the amount of ESBies that the EDA can issue. This maximum prevents the agency from falling into the temptation of issuing too many ESBies and becoming lax about ensuring their safety. Moreover, a hard upper bound would keep in check politicians that are tempted to pressure the EDA to finance persistent public-sector deficits. A hard limit of 60% of GDP, following the Maastricht criteria, may be a good starting point, although a more conservative approach may call for a smaller amount.

Another reason for an upper bound that is not too high, is that if countries place all of their bonds with the EDA, this would lead to complications on both sides of the market. On the side of the

sovereigns, they would not be receiving market signals about the sustainability of their fiscal positions, for the EDA, not private investors, would be the marginal buyer of the securities. On the side of the EDA, the portfolio weight of that country in the assets of the EDA would have to be lower, requiring an increase in the weight of the countries that are similar to it in credit risk to preserve the relative safety of the ESBies. Put more succinctly, if there is not enough public debt, there is not enough raw materials with which to build ESBies. This seems to be a remote problem for European public finances in the near future at least.

Beyond the strict rule, there is an automatic mechanism that would put a brake on having too many ESBies. The larger the amount of ESBies issued, the more funds must be committed to the capital guarantee. Keeping with the pessimistic simulation of the last section, if the EDA bought sovereign bonds in the amount of 60% of euro-zone GDP, the capital requirement would require setting aside €800 billions. If instead, it was 20% of Euro-area GDP, it would take only €265 billions. As some countries will always be reticent at some time to contribute more funds to the EDA, requiring that there is a unanimous agreement to raise the upper limit of the EDA will help to prevent such increases.

On the other side, there is a lower bound on the amount of ESBies to issue to ensure that European banks are able to hold them and satisfy their capital requirements, and that the market for them is sufficiently liquid. We do not believe that this lower bound would be that high, since as long as the ESBies become a safe haven for investors during crisis, their liquidity is guaranteed.[viii]

A third concern is that national governments or European institutions may pressure the EDA to use the funds in the capital guarantee to bail out the holders of the junior tranche whenever there is a sovereign default. Recall that the holders of this tranche are taking a risky position and being compensated for it, so it important that they do bear losses when defaults occur. There are a few ways to prevent these bail-outs. First, if the statutes of the EDA explicitly forbid the capital guarantee being used for *any* purpose beyond absorbing losses in the collateral pool of sovereign pool beyond the tranching threshold, there will be a significant legal hurdle for bailouts. Second, while banks and insurance companies would naturally hold ESBies, they should shy away from the junior tranche and its high risk. Therefore, they and their considerable lobbying power will be on the side of preventing bailouts of the junior tranche, which by eating into the capital guarantee of the ESBies would lower their safety and value. Third, if the sovereigns try to get around this constraint by posting additional capital to the EDA for the bailout, there should be a rule requiring unanimous agreement by all members and their respective parliaments. While the inability of European nations to agree on major changes on short

notice has been a weakness throughout this crisis, it can be turned into a mechanism to uphold a commitment against bail-outs that prevents a future crisis.

A final consideration regarding liquidity and the size of the ESBies program is that the EDA would be a very large purchaser in the sovereign bond markets that can have large price impacts. Hence, when buying sovereign bonds it will drive up the price of these bonds to at least the ask price, and symmetrically, it will drive down the price of the junior tranche to the bid. There are a few ways in which the EDA could deal with this problem of buying high and selling low. It could occasionally buy sovereign bonds in the primary market, or it could refuse to temporarily include a bond in the ESBies if the bid-ask spread is not sufficiently low. While this may require some expertise and good sense on the part of the EDA, it should not pose any insurmountable obstacles.

6.2 Vintages and maturity of the ESBies

Every so often, a new vintage of vintage of ESBies and junior tranches would be issued with new collateral in the form of recently issued sovereign bonds. This could happen as often as every two weeks, as in the case of US Treasuries, or as far apart as every 6 months. As long as the secondary market for ESBies is active and liquid, and as long as the EDA is able to sell the junior tranches, how often there are issues should not be too important. One feature that will arise with time is that each vintage of ESBies would be backed by slightly different collateral. In order to keep them equally safe, the tranching threshold may have to vary slightly across issues. There is nothing wrong with this, and if the ESBies of different vintages are correctly designed, then they would be very close to perfect substitutes even if not exactly identical. Issues may even be "re-opened", e.g., more of the same bond could be issued one year after the bond's issuance, to avoid off-the-run type phenomena. Reopening is already common for European sovereign bonds, and is done occasionally for US Treasuries.

As for the maturity of the ESBies, there are different clienteles for safe assets. Pension funds would like long-term ESBies, the ECB would prefer 3-month ESBies, and banks would like a variety in between. Our proposal is that at each issue, the EDA buys sovereign bonds of different maturities, and pools them, by maturity, to create ESBies for each desired maturity. This way, the EDA will not engage in any maturity transformation and so avoid funding liquidity (or rollover) risk. ESBies of all maturities will circulate, generating a risk-free yield curve that can be a useful indicator for policymakers and investors.

One slight complication is that for some maturities, there may not be enough bonds available of a particular sovereign to satisfy the GDP-based weights in the collateral pool. In that case, the weights

would have to be re-shuffled towards the available bonds of countries that have similar credit risk to the missing bonds. Yet, we suspect this will not be a common problem. Knowing that there is demand form the EDA for a specific amount of bonds with certain maturities, each country has a strong incentive to satisfy this demand, and so adjust the maturity of its primary issuances to ensure it. Moreover, some amount of coordination between the national debt issuers could be encouraged.

Another worry for the EDA is that there will be a lag between the time it buys the sovereign bonds, and the time it is able to issue and place both the ESBies and the junior tranches. If there are wild swings in the bonds' prices and credit risk or if it takes significantly longer than expected to find buyers for the ESBies and junior tranches, then the EDA will bear this cost of keeping the bonds in its warehouse. Insofar as the ESBies are widely held by European banks and investors, similarly to US Treasuries there should be a stable demand for them. If the EDA, moreover, secures the sell-off of the junior tranches before acquiring the sovereign bonds, then this warehousing risk will be limited. Moreover, national authorities should be encouraged to coordinate to a minimal extent on the dates of their issuances. Finally, as the EDA gains experience in the tranching step, it should be able to implement it quite quickly minimizing the lag between the purchase of the bonds and the sale of the ESBies and junior tranches.

Finally, to be clear, if the ESBies are accompanied by a capital guarantee, the latter will apply to all vintages and all maturities of ESBies outstanding. The capital guarantee can, inclusively, be used to make slightly different vintages of ESBies the same in terms of their safety and value. What if the extremely unlikely event occurs where a series of defaults in one European country after another uses up all of this capital? In this event, the member countries should have an option to recapitalize it. However, this should be approved by each national parliament for two reasons. First, so that it prevents illegitimate recapitalizations to bailout the junior tranche, as we discussed before. Second, because it provides a natural reset, whereby countries unhappy with the system can opt out.

6.3 The transition to a world with ESBies

In our view, introducing ESBies and adapting bank regulation and ECB procedures to accommodate them could have an immediate positive effect on the Eurozone. Breaking the diabolic loop between bank fragility and sovereign debt would go a long way to prevent the risk of contagion that has made the European crisis so difficult tot deal with.

Yet, it may be more appropriate to introduce ESBies gradually. Even with a target of issuing 60% of euro-zone GDP, it could be reached via monthly issues over 5 years building up to that amount. This would give the market and investors time to get used to the new security and learn about its legal details. This may be particularly important for the junior tranche. Moreover, if the ESBies become a safe haven for investors, they can become very popular and effective even with a limited amount of them in circulation. Financial markets are expert in building derivate products on securities like the ESBies that can greatly extend their usefulness and reach.

Another transitional step is the joint choice of the tranching threshold and the size of the capital guarantee. At first, it may be hard to raise capital of even a few tens of billion euros for the ESBies given the economic crisis in Europe. In that case, the tranching threshold could be higher to keep the ESBies very safe, so that for a given amount of sovereign bonds purchased, the EDA would be able to issue fewer ESBies. Then, as capital is raised, the threshold would fall, allowing for more ESBies to be issued.

One issue that cannot be sidestepped is the recapitalization of European banks. The ESBies do not change the need for it, but rather make it even clearer and, hopefully, would therefore help to make it happen sooner rather than later. As regulators raise the risk weights on sovereign bonds, banks will have to trade these bonds for ESBies at market prices, and will inevitably lead to losses for banks the need to recapitalize. Insofar as the introduction of ESBies eliminates part of the uncertainty from the crisis, the prices of sovereign bonds may increase, limiting this loss. But, it is inevitable that some recapitalization must take place.

To be clear, ESBies by themselves will not solve the European sovereign crisis. They are part of a solution that includes at least two other pillars, dealing with the risk of banks and sovereigns, and which we describe in a separate note. Combined, they could put the financial markets of the euro-zone in a sustainable path for the long run. Moreover, the ESBies do not solve the problems of growth, lack of competitiveness and public finances that affect the general well being of countries like Greece, Italy, Portugal, or Spain. What the ESBies do is to prevent these structural problems from feeding into a massive euro-wide financial crisis that puts in danger the whole European Union.

7. Alternatives and antecedents

Over the past months, a few proposals have been made to overcome Europe's problems. In this section, we briefly describe them and explain how ESBies are different. We also discuss some historical antecedents of the ESBies.

7.1. The difference from the operations of the EFSF

The EFSF, European Financial Stability Facility, was created in May of 2010 to provide loans to euro-area countries in trouble. It funds these by issuing its own bonds, guaranteed by all of the member states. We can reinterpret these actions as buying sovereign bonds and issuing its own bond, which has some similarities to the ESBies.

However, there are many crucial differences. First, the bonds issued by the EFSF are not each tightly linked to a portfolio of sovereign bonds. While the facility holds as assets sovereign bonds, it can change the composition of bonds it holds at any time without approval of its creditors. Second, the bonds issued by the EFSF are backed by the sovereign states and their taxing power over their citizens. While the states keep to this commitment, there is no equivalent of the junior tranche in our proposal to absorb any losses from default in the sovereign bonds. It will be the taxpayers of these countries that must shoulder any losses. If the states waver in this commitment, then the bonds issued by the EFSF will only be safe as long as the political circumstances are behind them. Third, and perhaps more crucially, the sovereign bonds held by the EFSF are, by design, the ones with the highest credit risk. Because the default of one of the countries in trouble would likely precipitate the default of another, there is almost no diversification achieved in this portfolio. In contrast, the ESBies are backed by a diversified pool of sovereign bonds, are relatively immune to political pressure and hesitations, and are made safe by using financial engineering---pooling, tranching, and capital guarantees---rather than by imposing a fiscal union on unwilling taxpayers.

7.2. The difference from Eurobonds

Eurobonds are bonds backed with solidarity by all of the member states. This would imply that if a bond was issued to finance a project in Portugal, in case the Portuguese state is unable to pay, it will be up to the other taxpayers in the euro-area to pay off the debt. Like ESBies, Eurobonds have the potential to become a safe asset by diversifying across sovereign states.

The main difference is that, unlike ESBies, Eurobonds involve "joint and several" guarantees, in which all parties are guarantors of the obligations of each of the other parties. As a result, Eurobonds require tight fiscal policy coordination among Eurozone member states, or they are subject to moral hazard as one member state runs up debts that it knows the others will partly for. With ESBies, the guarantee is provided by the pool of bonds, not by any future fiscal revenues. The joint and several guarantees would require a significant revision of European treaties and are opposed by a very large part of the European population.

Second, ESBies would in principle be safer than Eurobonds. Whereas the guiding principle behind a Eurobond is fiscal solidarity, the guiding principle behind ESBies is safety. There would always be some uncertainty that some member states would refuse to tax their citizens to pay these bonds if they perceived that they were unfairly heavily transferring funds to another rogue state. With ESBies, there is no such uncertainty, as political will is removed from the equation.

Third and related, recent research has identified the "safe haven" premium of U.S. Treasuries as being more due to their covariance structure with other assets rather than with the size of outstanding bonds. Eurobonds and ESBies could be similar in size, but ESBies are designed to be safer and so would capture the bulk of the elusive liquidity premium that is often put forward to support Eurobonds, but which Eurobonds may not get.

Fourth, ESBies are created together with a junior tranche. This brings the benefit that capital in "flight to quality" can shift between two Euro-zone securities during times of crisis, without leading to sudden shifts in the capital flows to a particular region. Eurobonds instead, have no risky counterpart.

Fourth, there is a hard limit on the amount of circulating ESBies, both in its rules as well as automatically by the availability of enough sovereign bonds with low default risk. With Eurobonds, instead, each country has a great incentive to issue many bonds and have others pay for them.

Fifth, and related, with Eurobonds individual countries lose the market signal on their fiscal accounts. Without national sovereign bonds, there are no country-specific bond prices to discipline fiscal policy in individual countries. For a small country, the effect on interest rates of issuing much more debt than it can pay may be negligible.

7.3. The difference from blue-red bonds

The Brueghel institute (Depla and Weizsacker, 2011) proposes a refinement of Eurobonds that addresses the last two criticisms. Blue Eurobonds with joint guarantees would be issued only up to 60%

of the Euro-zone GDP. Any additional (red) bonds would have to be issued by the sovereign, for which it would be entirely responsible as there would be a strict no bailout clause to any red bond. The interest rate on the red bonds, which would be the marginal bonds issued by a sovereign, would be priced correctly and give the appropriate signals to fiscal authorities.

At the same time, blue bonds would still suffer from serious shortcoming relative to ESBies. They involve a joint guarantee, with its coordination and political problems, and they would still be less safe than the ESBies insofar as the joint guarantee that Euro-area countries for blue bonds is not completely credible.

7.4. The difference from synthetic Eurobonds

As we were finalizing our own proposal, Beck, Uhlig and Waner (2011) suggested in an opinion piece the creation of "synthetic Eurobonds", which have many resemblances with our ESBies. They also noted that it was important to solve the crisis to create a euro-wide bond that European banks and the ECB could hold. They envision the creation of a European debt mutual fund that issues synthetic Eurobonds against a pool of sovereign bonds and reaps the benefits of diversification, just like the ESBies.

Our proposal goes further than theirs. On top of diversification, we add tranching and potentially the capital guarantee in order to make the ESBies truly safe. The focus of the ESBies is not to create a Euro-wide security per se, but to create a *safe* security. The synthetic Eurobonds are a portfolio that includes both the ESBies and the junior tranche in our proposal. They are much less safe than the ESBies. Finally, we envision the EDA as being immune from political pressure, and the sovereigns as continuing to issue sovereign debt alongside the ESBies, and have provided much detail in the previous sections on how to design the system to achieve these goals. In sum, the ESBies share he same starting point as the synthetic Eurobonds but go much further.

7.4. The difference from Fannie Mae and Freddie Mac

Fannie Mae and Freddie Mac are two U.S. institutions that buy mortgage bonds, pool them, and sell securities backed by these mortgages to other investors. Given that the two institutions had to be bailed out by the U.S. government, does the same fate await the EDA?

Not at all. The key difference between Fannie and Freddie's structure and the EDA is that Freddie and Fannie assumed all the default risk on the underlying mortgages, issuing mortgage-backed

securities that only contained interest rate risk. While Freddie and Fannie charged a price for the default risk they took on, its price was woefully inadequate because of the implicit government backing it received. That same government backing also induced it to take riskier mortgages onto its own balance sheet. The EDA has none of these design flaws. It would issue junior bonds that would bear virtually all the default risk on the underlying sovereign bonds. Its portfolio weights would be formulaic and immune to political pressure. Freddie and Fannie had private shareholders, pushing it to take on more credit risk onto its balance sheet and to compete aggressively with other private mortgage market players. The EDA instead has public shareholders, and similar to multilateral agencies like the ECB or the IMF, a clear mandate to produce the safest bond possible. There is a hard limit on the total issuance of ESBies, and the holders of the junior tranche have absolutely no control rights over the EDAs actions.

7.4. The difference from private CDOs

The ESBies are collateralized debt obligations (CDOs). Given that a part of the financial crisis of the last few years was the break down of debt securitization, we must avoid the mistakes of the past.

First, whereas the issuers of private CDOs in the US were private banks who, in some cases, appear to have manipulated the content of the contract to favor some clients, the EDA is a public multilateral institution. The EDA's incentives should be aligned with those of the public, and these are several extra checks and balances in our proposal to ensure this is the case.

Second, the portfolio weights of the sovereign bonds are fixed ex ante (equal to GDP) shares, and there is no scope for the issuer to manipulate them. The ESBies are transparent and have rules that are easy to monitor, whereas the private CDOs leading to the crisis were opaque. Along the same lines, there are only two tranches in our proposal, ESBies and junior tranche, whereas many of the problems with the CDOs had to do with their multiple intermediate tranches and further rounds of repackaging.

Third, there are will be a separate market for each of the component securities of the ESBIES, where prices can be observed and where the right incentives will be preserved. This was not the case in the case of CDOs, which often were the only vehicle through which investors could access some specific assets, like particular mortgages.

8. Conclusion

This proposal is a first step both towards solving he current sovereign crisis, and towards building a sustainable institutional framework for the Euro.

In the short run, by allowing all European countries to reenter the capital markets, it will slowly reduce the panic that is currently griping the market. Moreover, by substantially reducing the risk of contagion between banks and sovereigns, and the apocalyptic scenarios where the EMU project collapses, the ESBies will contribute substantially to stabilizing markets.

In the long run, by correcting the regulatory errors that were at the origin of the crisis, the proposal lays the foundations for a stronger Euro Zone in the long run. The current problems may not have arisen without the Basel 0-risk weight for sovereign bonds. Prices will recover their informational function and will allow the market to make capital allocation decisions taking into account the proper risks.

In our view, two more elements are necessary to stabilize the shaky foundations of the Euro. First, some sovereigns are undoubtedly insolvent. A credible, orderly, bankruptcy procedure for sovereigns that minimizes the risk of contagion is needed. Second, the financial system of the Eurozone is too fragile and contains too many systemically risky institutions. A Eurozone-wide banking resolution regime, able to prevent contagion and protect European depositors, must be put in place. In the next few weeks, we will make concrete proposals in this direction.

Appendix: Numerical simulations of the ESBies safety

We conduct two numerical simulations to gauge the safety of the ESBies and to determine the tranching threshold that separates them from the junior tranche. In one we take a pessimistic scenario where there is a high probability of simultaneous defaults in several countries of the euro-zone. Another maybe more realistic scenario uses the default probabilities and recovery rates in the historical data in the last 20 years. We present each in turn. In both cases, we set the weight of each sovereign in the collateral pool, the asset side of the structure, equal to its average share of euro-zone (EZ) GDP between 2006 and 2010. These weights are listed in the second column of Table 1 below.

Pessimistic Benchmark Scenario

Table 1 orders the countries in terms of their current sovereign credit ratings (assessed by Moody's and S&P).

We assume that there are 3 aggregate states of the world that describe the health of the EZ economy. In state 1, a catastrophe unfolds (a great depression) and default risk is very high for all countries, but more so for periphery than for core countries. The idiosyncratic default probability in this state is labeled probdef1 and is listed in the second column of Table 1. It refers to a cumulative default rate over a 5-year period. State 2 is a bad state of the world (a recession) with elevated idiosyncratic default risk in all countries (probdef2). State 3 is the good state (expansion) with low idiosyncratic default risk for all countries except Greece (probdef3). We assume that the economy is in the catastrophic state 5% of the time, in the bad state 25% of the time, and in the good state 70% of the time. The random variable that governs defaults has a fat-tailed distribution (Student-t with 4 degrees of freedom).

Second, we assume that losses given default vary by country and depend on the aggregate state of the economy; they are higher in the worse aggregate states and higher for Greece than Germany in every aggregate state of the world. They are listed in columns 4 through 6 for states 1 through 3, respectively.

Third, we assume that country defaults are idiosyncratic events within each aggregate state. Because idiosyncratic default rates are much higher in state 1 and in state 3 for all countries, default intensities are correlated. In addition, we overlay the following assumptions on default behavior that further increase the cross-country correlation between defaults:

- Whenever there is a Spanish default, the EZ countries with better credit ratings than Spain (listed in the first seven rows of Table 1) default with probability 15% and the remaining 9 countries (in the last 9 rows of table 1) default with probability 65%.
- Whenever there is an Italian default, the top 7-rated countries default with probability 25% and the remaining 9 countries default with probability 65%.
- Whenever there is either a French or a German default, all other countries default with probability 80%.

One way to express the commonality in defaults across countries is to ask what fraction of the covariation of default events can be explained with the first (first three) principal components of the default covariance matrix of the 17 EZ countries. For the parameters listed in Table 1, the first (three) principal component of defaults explains (explain) 41% (73%) of the variation between default rates. This large covariation substantially reduces the gains from diversification. We do not repeat the mistake made in the structuring of mortgage-related products where correlations between the default risk of underlying mortgage loans where routinely assumed to be below 15%.

Based on a simulation of 2,000 periods, in each of which we consider 5,000 draws of the default process (for a total of 10 million iterations), we calculated the default rate for each country and we calculate how often the portfolio of sovereign bonds (based on the GDP weights) makes losses above 10%, 20%, and 30%. The last column of Table 1 reports the unconditional default rates, measuring a cumulative rate over a 5-year period, for each country under our assumptions. They combine the information on the idiosyncratic default rates in each aggregate state with the assumptions on commonality of default when one of the four large countries defaults and with the probabilities of each of the aggregate states. For example, the unconditional default rate of Germany is 1.11%. This number results from a marginal probability of default of 5.5% conditional on being in state 1, a marginal default probability of 1.9% in state 2, and of 0.6% in state 3. The idiosyncratic probabilities of default reported in columns 3-5 only average to a default rate of 0.50% (=5%*0.5%+25%*0.1%+70%*0%) so that the remaining 0.61% (=1.11%-0.50%) arises from our auxiliary assumptions on the default of Spain, Italy, or France. Similar logic extends to the other countries. These default rates are very conservative (they are high), in light of the current credit ratings of the sovereign bonds.

Based on this simulation, we find that the portfolio of sovereign bonds has a loss distribution with a 90^{th} percentile of 4.25%. That is, losses on the portfolio exceed 10% in 4.25% of the 10 million draws. The 80^{th} percentile of the loss distribution is 2.71%. Finally, the 70^{th} percentile of the loss distribution is 0.80%. This means that if we create ESBies that represent 70% of the value of the underlying collateral pool, they will be affected by losses in only 0.80% of the periods or once in every 125 5-year periods. Since our assumptions on default rates, losses given default, default correlations were all conservative, the 70% tranche is likely even safer than indicated by its 0.80% expected default rate. Note that the ESBies are safer than German bonds in this simulation.

The collateral pool has zero losses in 36% of the 10mi draws. Conditional on having a non-zero loss, the average loss is 3.3%. The unconditional average loss across all 10mi draws is 2.12%. This is the probability weighted average of a marginal loss of 11.09% in state 1, 4.14% in state 2, and 1.06% in state 3. Conditional on a portfolio loss in excess of 30% (the states of the world in which ESBies are affected), the mean loss is 44.6%. Conditional on a portfolio loss between 0 and 30% (the states of the world in which the junior tranche is affected), the mean portfolio loss is 2.85%. The mean loss on the junior tranche (including the states of the world with no losses) is 1.82%.

According to these same simulations, losses rarely exceed 30%; they do so with probability 0.80%. In our proposal, the first 30% of losses would go to the holders of the junior tranches. To further protect the holders of ESBies, a capital guarantee could be added to the protection offered by subordination. To eliminate losses that occur between the 99.2^{th} and 99.7^{th} percent of the loss distribution, a capital guarantee of 14.56% would be needed in our example. If 60% of EZ GDP is securitized in the form of ESBies, the long-run size of the program would be 60% of euro 9.17 trillion (2010 number) or 5.50 trillion. ESBies would represent 70% of this or they would be euro 3.85 trillion. The required capital guarantee would be 800 billion euros. Note that this capital would only be touched with a very small likelihood (0.8%).

Table 1. Defaults and losses on the collateral pool of ESBies in a pessimistic scenario

Notes: Column 1 reports the country and the Moody's and S&P credit rating as of August 2011. The second column reports the weight of each country in the collateral pool. Column 3-5 report the idiosyncratic (not the total) default rate conditional on aggregate state 1, 2, and 3. Columns 6-8 report the loss given default conditional on default occurring in aggregate state 1, 2, and 3. Column 9 reports the unconditional expected default rate which combines the idiosyncratic probabilities of default in columns 3-5, the auxiliary assumptions on default of Spain, Italy, France, and Germany, and the probability distribution over aggregate states.

Country (rating)	**weight**	**probdefd1**	**probdef2**	**probdef3**	**lgd1**	**lgd2**	**lgd3**	**default rate**
Germany (AAA)	26.86	0.5	0.1	0	40	32	20	1.11
France (AAA)	21.01	0.5	0.1	0	40	32	20	1.11
Netherlands (AAA)	6.38	0.5	0.1	0	40	32	20	1.14
Austria (AAA)	3.06	0.5	0.1	0	40	32	20	1.14
Finland (AAA)	1.97	0.5	0.1	0	40	32	20	1.14
Luxembourg (AAA)	0.42	0.5	0.1	0	40	32	20	1.14
Belgium (Aa1/AA+)	3.76	5.0	0.5	0.1	50	40	25	1.52
Spain (Aa2/AA)	11.67	10.0	2.0	0.5	60	48	30	3.76
Slovenia (Aa2/AA)	0.39	10.0	2.0	1.0	60	48	30	4.88
Estonia (Aa3/A)	0.16	10.0	2.0	1.0	65	52	32.5	4.88
Slovakia (A1/A)	0.65	10.0	5.0	1.0	70	56	35	5.55
Italy (A1/A)	17.07	20.0	6.0	1.5	75	60	37.5	4.37
Malta (A2/A)	0.07	30.0	7.0	1.6	80	64	40	7.24
Cyprus (Bbb/BBB)	0.18	35.0	10.0	3.0	85	68	42.5	9.10
Ireland (Bb1/BB+)	1.93	50.0	20.0	4.0	90	72	45	12.65
Portugal (Bb3/BB)	1.88	60.0	30.0	5.0	90	72	45	16.04
Greece (Ca/CCC)	2.54	99.80	90.0	40.0	95	76	47.5	55.74
Portfolio	**100**	**9.90**	**4.64**	**1.52**	**52.4**	**41.9**	**26.2**	**3.95**

Historical Scenario

In a second exercise, we use historical expected default rates and recovery rates on sovereign bonds. In fact, the recovery rates we use are the same as in the previous exercise, and those correspond to historical average recovery rates from previous sovereign defaults.[1] We use five-year average cumulative default rates by initial credit rating for *corporate bonds*. These default rates are higher than the corresponding default rates for sovereign bonds. We use the corporate rates because the sovereign default rates are exactly zero for all bonds rated A or above for the 1983-2007 sample period we use as a data source. In that sense, even the historical scenario is pessimistic. We recalibrate the probabilities of default in aggregate states 1, 2, and 3 in order to arrive at an expected default rate for each country that corresponds to the expected default rate on a company with the same credit rating as that country (as of August 2011).

Table 2 contains the parameter assumptions as well as the resulting expected default rate for each country. We note that for the AAA, AA, and A rated countries, the expected default rates still exceed the historical averages on equally-rated corporate bonds, which are 0.08%, 0.18%, and 0.50%, respectively. The rest of the simulation exercise is identical to our pessimistic benchmark case described above. The first (three) principal components of default realizations explain 50% (84%) of the common variation across countries.

The main result is that the 70% ESBies tranche now sustains losses in only 0.11% of periods, as opposed to the 0.80% of periods under our benchmark calibration. Even an 80% ESBies tranche would only sustain losses with probability 0.5% compared to 2.7% in the benchmark. The capital guarantee, which covered losses between the 99.2^{th} and 99.7^{th} percentiles in the benchmark case, becomes redundant in this historical case. An 11.9% capital guarantee would cover losses between the 99.88^{th} and 99.96^{th} percentile of the loss distribution.

[1] We use data on recovery rates and 5-year cumulative default rates from a March 2008 Moody's Global Credit Research report titled "Sovereign Default and Recovery Rates, 1983-2007," Exhibit 8 and 9.

Table 2. Defaults and losses on the collateral pool of ESBies in a historical scenario

Notes: Column 1 reports the country and the Moody's and S&P credit rating as of August 2011. The second column reports the weight of each country in the collateral pool. Column 3-5 report the idiosyncratic (not the total) default rate conditional on aggregate state 1, 2, and 3. Columns 6-8 report the loss given default conditional on default occurring in aggregate state 1, 2, and 3. Column 9 reports the unconditional expected default rate which combines the idiosyncratic probabilities of default in columns 3-5, the auxiliary assumptions on default of Spain, Italy, France, and Germany, and the probability distribution over aggregate states.

Country (rating)	**weights**	**probdefd1**	**probdef2**	**probdef3**	**lgd1**	**lgd2**	**lgd3**	**default rate**
Germany (AAA)	26.86	0	0	0	40	32	20	0.15
France (AAA)	21.01	0	0	0	40	32	20	0.15
Netherlands (AAA)	6.38	0	0	0	40	32	20	0.15
Austria (AAA)	3.06	0	0	0	40	32	20	0.15
Finland (AAA)	1.97	0	0	0	40	32	20	0.15
Luxembourg (AAA)	0.42	0	0	0	40	32	20	0.15
Belgium (Aa1/AA+)	3.76	1.0	0.5	0.1	50	40	25	0.40
Spain (Aa2/AA)	11.67	1.5	0.7	0.1	60	48	30	0.76
Slovenia (Aa2/AA)	0.39	1.4	0.6	0.1	60	48	30	0.88
Estonia (Aa3/A)	0.16	3.0	0.8	0.1	65	52	32.5	1.02
Slovakia (A1/A)	0.65	4.5	1.0	0.15	70	56	35	1.18
Italy (A1/A)	17.07	6.0	1.5	0.2	75	60	37.5	0.99
Malta (A2/A)	0.07	4.5	1.2	0.15	80	64	40	1.23
Cyprus (Bbb/BBB)	0.18	10.0	3.0	0.5	85	68	42.5	2.20
Ireland (Bb1/BB+)	1.93	65.0	15.0	4.0	90	72	45	10.48
Portugal (Bb3/BB)	1.88	65.0	15.0	4.0	90	72	45	10.49
Greece (Ca/CCC)	2.54	99.80	80.0	34.0	95	76	47.5	49.28
Portfolio	**100**	**6.31**	**2.98**	**1.07**	**52.4**	**41.9**	**26.2**	**2.03**

[i] This is an extract from a chapter of a book being produced as a larger project, Project Europe, by the euro-nomics group: www.euro-nomics.com. That project proposes a new institutional framework for the European financial system to overcome the current crisis. European Safe Bonds are one of the legs of that proposal, and are explained in this document. We are not sponsored by any organization or institution and are independent from any country or policy institution.

[ii] Farhi, Gourinchas and Rey (2011) go in detail over the many reasons why the demand for safe assets far outstrips supply today.

[iii] Krishnamurthy and Vissing-Jorgensen (2010) estimate this premium.

[iv] Some empirical evidence for the "flight to safety premium" for German bunds is that their yield sank to an almost record low in August and September, while at the same time the CDS spread for German bunds increased, indicating that even Germany's default risk was increasing.

[v] ESBies has the merit of capturing the sound of two possible initials for the securities, ESB for European Safe Bonds, and ESBBS for European Sovereign Bond-backed Securities.

[vi] A US analogy may be helpful. US banks hold primarily US Treasuries, while municipal bonds are primarily held by private investors. Hence, a default by a state or municipality has much smaller contagion potential.

[vii] Another leg of our proposal is the creation of a Euro-wide deposit insurance facility. That would also require some upfront capital, so raising it could be combined with raising capital for the credit enhancement of the ESBies.

[viii] As an example, Swiss bonds are often used as liquid safe assets because their return tends to rise during crisis, even though the amount in circulation is very small.