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The European Stability Mechanism — bastion of calm or crisis accelerant?

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Abstract

The European Stability Mechanism (ESM) is the permanent crisis resolution mechanism for euro area countries. We analyze the costs of the current (suboptimal) refinancing design of the ESM and evaluate an alternative asset-backed securities (ABS) structure under different scenarios. Our simulation results indicate that switching to an ABS structure could substantially lower ESM refunding costs by up to 3.5%. Moreover, the current structure severely limits the ESM's potential to stabilize financial markets. In particular, in the most likely type of future crises, namely medium-sized requests for financial support from distressed ESM members accompanied by other ESM countries unwilling or unable to provide new capital, the ESM is likely to unintentionally act as a crisis accelerant rather than a stabilizer.

Keywords

European Stability Mechanism (ESM), financial instruments, euro area, ABS

JEL classification

E6, F34, F55, G15

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I. Motivation

In the aftermath of the U.S. subprime crisis, a number of European countries faced severe financial stress, with interest spreads on sovereign bonds increasing dramatically in the spring of 2010. Starting with Greece in May 2010, several euro area Member States asked for and received financial help to cope with higher refinancing costs and, in some cases, even the loss of financial market access. At the time, there were no adequate financial backstops in place, so fiscal assistance was organized ad hoc, first on a bilateral basis in the case of Greece, and subsequently via two newly established multilateral vehicles, the European Financial Stability Facility (EFSF) and the European Financial Stabilisation Mechanism (EFSM).

In October 2012, these temporary crisis management mechanisms were replaced by the European Stability Mechanism (ESM) (ESM 2013b). Today, the ESM is the permanent crisis resolution mechanism of the euro area and is viewed by many as necessary for securing the stability of the Economic and Monetary Union (EMU) at large. The ESM is supposed to lessen demands on the European Central bank (ECB) for ever more expansionary policies and complements several recent initiatives to improve economic governance and crisis prevention, including the Treaty on Stability, Coordination and Governance in the Economic and Monetary Union, the Macroeconomic Imbalance Procedure, and stricter financial market regulations.

The ESM was founded by the euro area Member States to provide financial support for euro area Member States under financial stress. De facto, the ESM is a huge special purpose vehicle which acts as an intermediary and provides liquidity and credit lines if markets' confidence in the creditworthiness of some European sovereigns deteriorates. The ESM issues debt instruments to finance loans and other forms of financial assistance at below market interest rates and in general with long maturities. ESM assistance is restricted to situations in which the financial stability of the euro area as a whole and in specific cases of individual Member States is threatened. It is subject to conditionality, and only countries with (temporary) illiquidity problems, not solvency issues, are eligible. As such, the ESM is supposed to provide trust in sovereigns' financing process if markets confidence in a country's solvency deteriorates. Our results however raise serious doubts on the ESM's ability to stabilize given the current refinancing design. The amount and form of support is determined based on a conventional debt sustainability analysis. Its subscribed capital base consists of paid-in capital and so-called callable capital, which is requested from the member countries in the event of losses exceeding paid-in capital.

The ESM and its predecessors were established under immense time pressure in a political environment "in crisis mode". Not surprisingly, the (limited) public and academic discussion at the time focused on the "700 + x billion euro" question, namely, (1) the appropriate amount of assistance the ESM was to provide, and (2) the associated risks for the Member States that were to guarantee the ESM. In contrast, important qualitative aspects of the ESM design received very little, if any, attention. And yet these decisions on the ESM's organizational structure, the type of financial assistance it can provide, and its refinancing instruments are crucial for the workings and the effects of the ESM, namely, the costs of providing financial help, the distribution of these costs and risks among its members, and the ESM ability to stabilize financial markets in times of economic stress.

The ESM founders aimed for an AAA rating and restricted the credit volume to 500bn€ given subscribed capital of 700bn€. They eschewed, possibly for political and regulatory[1] reasons, structural financing with asset-backed securities (ABS) and opted for conventional bonds as a means of funding.[2] Both decisions imply considerable opportunity costs, yet an AAA rating could not be achieved so far by all main credit rating agencies[3]. If markets (and the rating agencies) expected that ESM members fulfilled their commitment to provide called capital, the ESM would carry a AAA rating by all rating agencies. It then could also refinance at an interest rate comparable to the German government or other institutions to be considered (relatively) riskless creditors. Neither of these two conditions holds currently.

Generally, asset-backed securities (ABS) can improve the refinancing of a set of risky assets. Income streams are pooled to profit from diversification and portioned risk is sold in tranches. The nonlinear pricing of risk in markets due to risk aversion can reduce refinancing costs, that is, the weighted average of the interest rate of the different tranches is smaller than interest rate paid on the underlying assets, an effect comparable to inverse insurance. The lower the correlation between the assets, the stronger the diversification effect and the more efficient the structuring. Additionally, pooling and structuring allow a better match between the

[1] The current regulatory framework for investors (banks, insurances, …) is penalizing with regards to the treatment of securitizations. Thus investors might have no appetite or are legally restricted to hold such a securitized ESM bond. This regulatory aspect is not further considered in this paper, should however be tackled if structured ESM bonds were to considered.

[2] Obviously, structured financial instruments have been at the center of the subprime crisis and are even considered by some observers to have caused the financial market turmoil (see e.g. Coval et al (2009)). Although we, too, are critical of the highly leveraged and extremely nontransparent structuring of subprime assets, we find it important not to ignore the potential of securitization to improve financing conditions. In our view, it would be counterproductive to abstain from financial structuring just because of the aberrations that led to the subprime crisis.

[3] In mid-2016, i.e. under very favorable conditions, the ESM was assigned a top AAA rating by Fitch, and the second highest Aa1 rating by Moody's. No rating was publicly available from S&P.

refinancing and investor preferences (e.g., yielding investment grade tranches) and provide information on the risk of the tranches. The accompanying costs of structuring obviously somewhat reduce its efficiency.

To date, there exists only very limited research on the ESM. Proposals for a fiscal union with instruments like the ESM to complement the monetary union have been made and discussed by Italianer and Vanheukelen (1993), Gros and Micossi (2008), and Menguy (2010). Introduction of the EFSF reawakened the debate over such instruments – both at the technical (e.g., Huizinga and Horváth (2011) and the policy level (e.g., Gros and Mayer 2011). Most contributions on the ESM take a more general policy perspective on whether it is a useful and adequate financial backstop (e.g., Bijlsma and Vallée 2012; Buch 2012; Christova 2011; Gros and Mayer 2012; Klodt 2011; Micossi *et al.* 2011). A smaller strand of the literature focuses on the legal aspects of the ESM and whether it is compatible with EU or national (mainly German) law (e.g., Faßbender 2010; Herrmann 2012; Schmidt 2013). More technical approaches assessing the economic implications of the ESM are developed e.g. by Kapp (2012), who uses a core-periphery model to determine the optimal size of the ESM. Taken together, a comprehensive analysis of the workings and efficiency of the ESM is still pending.

In our analysis[4] we want to take a first step in this direction. We focus on a number of features that affect the ESM's suitability as a crisis resolution mechanism and determine the scope and distribution of costs for participating Member States and investors. What are the costs of the different financial instruments, such as loans and secondary market purchases, to providers and recipients of financial support? How do market expectations about the guarantees made by ESM members affect the refinancing costs and their distribution between the participating parties? What are the effects of aiming for an AAA rating instead of using structured financing and issuing bonds with different ratings? And, most importantly, is the ESM able to stabilize financial markets under the crisis scenarios likely to occur in the future?

The main contribution of our analysis is to quantify the effects of important institutional ESM features. While a qualitative analysis of such features yields mostly straightforward and thus unsurprising results, only a quantitative analysis can specify the (distribution of) costs and ESM's stabilizing potential. However, only by quantifying the ESM's costs and their distribution, the implications of alternative institutional ESM features can be evaluated and the workings of the ESM be improved. The so-called "*expected callable capital effect*" is central for the potential gains the ESM could realize with an ABS approach. We find that if in

[4] See Hild (2016) for primal reflections in this area.

crises situations market expectations on callable capital deteriorate, subsequent ESM downgrading might act as a negative coordination signal which could trigger a vicious circle with a further loss in trust, worsening ESM refinancing conditions and aggravating the financial crisis.

The costs of ABS-type funding depend in a complex way on total credit relative to market-expected callable capital and paid-in capital. This *"expected callable capital effect"* has a strong impact on the ESM funding rate and thus on the ESM's potential to generate profits on behalf of its members and/or beneficiaries. In a simulation study for the most likely crisis case of an intermediate request for financial support, we find an interest advantage of the ABS refinancing design of 2.5% p.a.

We also analyze the effects of the choice of *instrument* and the *composition* of the countries demanding financial aid. (1) The choice of instrument is central for the distribution of gains between, on the one hand, the ESM and its members and, on the other hand, the beneficiary countries. If support is provided under the loan scheme, the beneficiary country profits from the lower ESM refinancing interest rates, while in the case of secondary market interventions the interest spread is retained by the ESM. (2) The so-called "*composition effect*" encompasses the specific countries that ask for financial support as well as the requested amounts of aid. The more the volume of credits exceeds expected ESM equity (i.e., paid-in capital, retained profits, and expected callable capital), the higher the risk for investors and the higher the interest they demand. A higher number of debtors and a lower correlation between their financial problems increase the benefits of diversification, thereby reducing the refinancing interest rate.[5] Both effects are qualitatively as expected and support our findings on the *"expected callable-capital effect*."

Since composition, size and expected callable capital effects are not linear, we use a simulation approach to analyze how funding costs and financial stability depend on the refinancing design. We evaluate the various features of the ESM against the following criteria: (1) costs and benefits for the fund, (2) distribution of costs and benefits among ESM members, and (3) robustness to deteriorating market expectations of callable capital, that is, the guarantees by ESM members to compensate for ESM losses.

[5] See, in this context, the structured Eurobonds scheme by Hild et al. (2014), which can be read as a proposal to optimize ESM financing. The more Member States that would receive financial assistance, the stronger the diversification effects of a structured ESM bond. See also Bauer *et al*. (2008) for further analysis regarding diversification effects in structured products of sovereign bonds.

In the following, we quantify the benefits if the ESM had opted for the issuance of structured bonds with tranches of different credit risk and rating and discuss why the current design might lead to a self-enforcing loss of trust in crises situations. We find that an ABS approach would not only allow to reduce funding costs of the ESM considerably. Even more importantly such a structure would make the funding of the ESM more robust in times of crisis. With its current design the ESM is likely to unintentionally act as a crisis accelerant rather than a stabilizer in particular in the most likely type of future crises, namely medium-sized requests for financial support from distressed ESM members accompanied by other ESM countries unwilling or unable to provide new capital.

The paper is organized as follows. Section II describes the overall structure and main components of the ESM. Section III presents our empirical analysis. Section IV discusses the main results of the simulation study and in Section V the composition und instrument effects are considered. In Section VI we check for robustness of our assumptions, and Section VII concludes.

II. The Structure of the ESM

General Structure

The ESM, an intergovernmental institution established under public international law, was created by euro area Member States in order to mobilize temporary financial support for euro area Member States[6] facing liquidity problems that threaten the financial stability of the euro area. The ESM's total subscribed capital of 700bn€ consists of 80bn€ of paid-in capital[7] and 620bn€ of callable capital that ESM members are supposed to supply in the event of losses.[8]

[6] We base our empirical analysis on the euro area of the 17, that is, before the accession of Latvia in 2014 and Lithuania in 2015. Our empirical results should hold for the euro area of the 19 accordingly.

[7] In April 2014, the entire paid-in capital was provided by the original 17 Member States (ESM 2013a, p. 2). Latvia and Lithuania will provide their share of paid-in capital by 2018, resulting in total paid-in capital of € 80.55 bn (ESM 2016, p. 3).

[8] There is no "stepping-out-guarantor" scheme as under the EFSF. Even Member States that are receiving financial assistance via the ESM are obliged to make their contribution to the paid-in capital and to the callable capital in the event the paid-in capital is reduced due to losses. If an ESM member fails to pay its contribution, it loses its voting rights within the ESM (ESM 2012b). If a Member State does not contribute its share during a capital call, a revised capital call will be made, increasing the contribution rate of the remaining ESM members (pro-rata basis). A Member State that receives ESM assistance and cannot contribute its share will be obliged to increase its credit from the ESM to comply with its payments. Some Member States that were already under a macroeconomic adjustment program when the ESM was established financed their paid-in capital with financial assistance (e.g., Greece) (European Commission 2012, p. 60).

These funds are provided by all euro area countries according to the ESM shareholder contribution key which is derived from the ECB's capital key and reflects the respective country's share in euro area's total population and gross domestic product. The ESM issues securities with short and long maturities to fund its financial support. Paid-in capital serves as collateral only. The lending capacity is limited to 500bn€. This over-collateralized capital structure[9] was chosen to achieve a AAA rating (European Central Bank 2011, p. 82).

Financial assistance to a beneficiary Member State is subject to IMF-type conditionality detailed in a Memorandum of Understanding (General Secretariat of the Council 2011, p. 25). The ESM has six types of instruments at its disposal: (1) precautionary financial assistance in the form of a credit line, (2) loans to governments to recapitalize banks only, (3) loans to governments, (4) purchases of government bonds on the primary markets, (5) purchases of government bonds on the secondary markets, and (6) direct recapitalization of financial institutions.

We focus our analysis on the ESM's two most important instruments: loans and secondary market purchases. These instruments differ mainly with respect to the distribution of the spread between the ESM refinancing rate r_{ESM} and a beneficiary's market interest rate r_{ben}.

In the case of loans, the ESM charges its refinancing rate r_{ESM} plus an "appropriate margin" r_{margin} (Art. 20 of the Treaty) of currently 0.1% and a one-time service fee of 0.5% (ESM, 2012a). In the case of precautionary assistance and primary market interventions, the margin increases to 0.35%. In the case of secondary market interventions, the spread or risk premium $risk = r_{ben} - r_{ESM}$ is collected by the fund in full. In times of crises, the risk premium is likely to be higher than the appropriate margin, so that the following situation holds:

(1) $$r_{loan} = r_{ESM} + r_{margin} < r_{ESM} + risk = r_{ben}$$

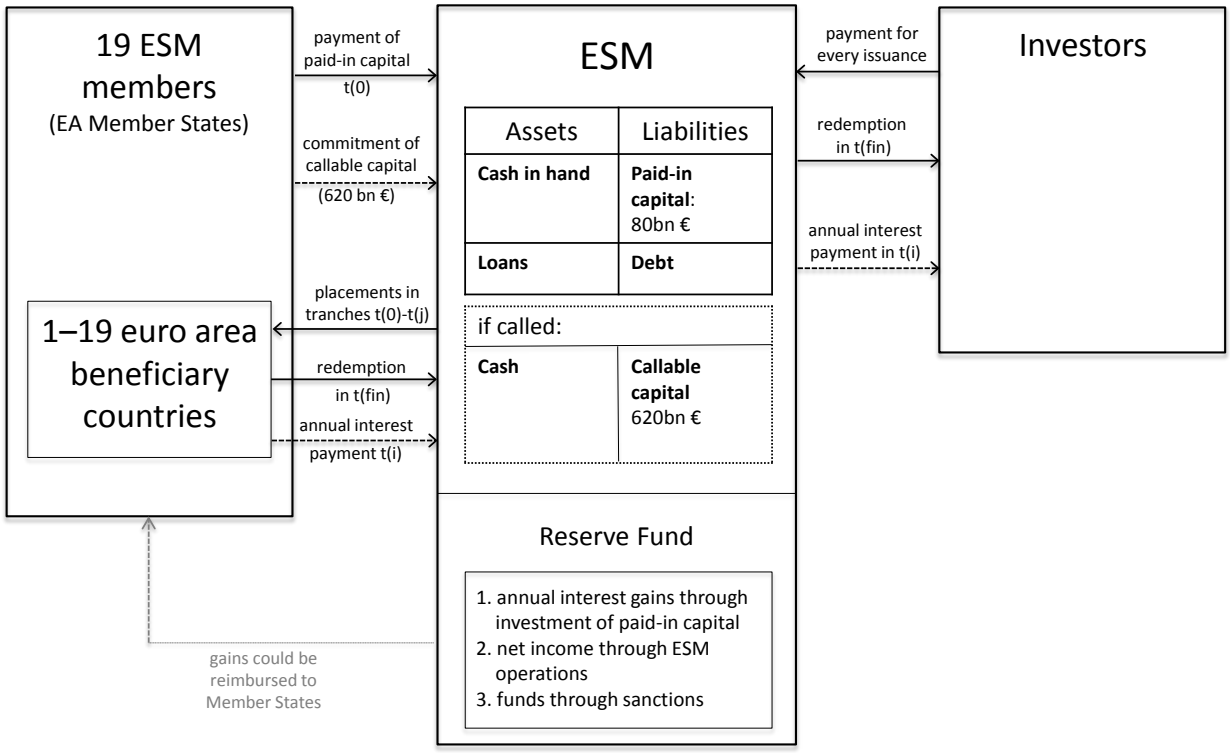
Capital Flows with the ESM

Three types of agents are involved in the ESM crisis resolution mechanism: (1) the euro area countries as ESM owners and, possibly, clients, (2) the ESM itself, and (3) the investors. Euro area Member States are mandatory shareholders of the ESM and have to provide paid-in capital as well as allocate callable capital when requested to do so; they can also become clients by applying for funds from the ESM in case of a financial crisis. The ESM is an

[9] To determine the lending capacity only the callable capital of AAA- and AA-rated Member States was counted.

intergovernmental institution that issues bonds so as to provide financial support to beneficiary countries. Investors purchase ESM bonds.

Figure 1: The general structure of the ESM



Source: Authors' illustration.

The participants are interlinked via various types of capital flows (see Figure 1). The ESM started with its members contributing their respective share of paid-in capital and committing to contribute additional so-called callable capital if requested by the ESM. If a Member State is eligible for financial assistance, the ESM disburses the funds in several tranches, depending on the progress made within the agreed-upon adjustment programs. A beneficiary country pays its interest annually and refunds the notional at the end of the program. To fund this financial assistance, the ESM issues bills and bonds. These are bought by investors who receive annual interest payments until the end of the transaction, when they are reimbursed. The paid-in capital is not used for financial assistance directly but put aside to absorb potential losses only. It is invested in high-quality liquid assets and profits are transferred to the reserve fund. Additionally, the net income generated from ESM operations, as well as monetary sanctions collected from ESM Members under various European surveillance

procedures,[10] are collected in the reserve fund. Profits exceeding the paid-in capital of 80bn€ might be reimbursed to the ESM owners or the clients.

III. A Simulation Model

Model specifications

We base our model on the capital flows depicted in Figure 1. For simplicity, we assume that the requested capital is paid to the beneficiary country in one tranche in t(0). We evaluate the different scenarios with respect to the efficient tranching of the ESM bonds as well as expected gains and losses for the different participants.

In each period *t*, ESM reserve funds a_t increase due to incoming interest payments I_t and recovery payments D_t and decline with interest expenses O_t:

$$a_t = a_{t-1} + D_t + I_t - O_t . \tag{2}$$

The ESM receives two types of interest income: interest on current ESM funds with the safe interest rate and interest payments by those countries out of the n beneficiaries that have not yet defaulted:

$$I_t = a_{t-1} \cdot r_{safe} + \sum_{i=1}^{n} C_i \cdot r_i \cdot \Im_{t<t_{iD}} \tag{3}$$

where C_i is the credit sum of country *i*. The country's interest rate r_i is either the market interest rate for secondary market interventions or the average ESM refinancing interest rate plus the margin of 0.1%, for the loan instrument.[11] $\Im$ denotes the indicator function, yielding 1 if *t* is less than country *i*'s time of default t_{iD} and 0 otherwise. We set $t_{iD} = T + 1$ if country *i* does not default. Using the recovery rate *rr*, we obtain for the recovery payments:

$$D_t = \sum_{i=1}^{n} C_i \cdot rr \cdot \Im_{t=t_{iD}} \tag{4}$$

[10] These procedures are the multilateral surveillance procedure, the excessive deficit procedure, and the macroeconomic imbalance procedure (ESM 2013b, p. 5).

[11] In $t = 0$ we also account for the upfront service fee of 0.5% of the credit sum to be paid by the beneficiaries.

We denote by *cc* the amount of (expected) callable capital paid if ESM funds are depleted and have to be replenished. Final ESM funds $a_T + cc - \sum_{i=1}^{n} C_i$ are risky due to the uncertainty of the default events and the weight of the tranches is chosen to satisfy the risk level of the respective rating.

ESM interest expenses are:

(5) $$O_t = \underbrace{\left(\sum_{i=1}^{n} C_i\right)}_{\text{total credit}} \underbrace{\sum_{j=1}^{k} e_j r_j}_{\text{average interest rate}}$$

where e_j is the weight of each tranche, i.e., $e_j \sum_{i=1}^{n} C_i$ is the amount refinanced in the *j*-th risk class with interest rate r_j.

Based on the assumptions on model parameters presented in the next subsections, we run Monte Carlo simulations with m = 100,000 loops to generate default behavior scenarios for the euro area countries that receive financial assistance from the ESM. In each simulation we draw yearly default events for a 10-year horizon for each of the participating countries.[12] With these data we derive a probability distribution of all payments (interest and final payments) of the beneficiary countries and the ESM and calculate the expected gains and losses.[13] Furthermore, our simulation allows us to discover under what conditions the ESM is able to maintain an overall AAA rating and when different tranches[14] are required.

Scenarios

To assess the structure of the ESM, we firstly focus on the specific effects of market-expected callable capital, namely the amount of the callable capital that markets expect Member States to actually provide after a capital call by the ESM in relation to the total amount of credit disbursed by the ESM. Note that while callable capital is included in the ESM balance sheet it

[12] Early repayments are not considered in the simulation.

[13] This distribution yields the nonpayment risk for the investors and thus defines the size of the different tranches. In general, the initial tranching and the resulting tranching do not match, so we start an iterative procedure using the result of the previous round as the initial tranching for the next one. The iteration is necessary since changes in the tranching influences the interest payments and thus may shift the final nonpayment risk. However, these effects are relatively small and therefore the iteration converges after the second or third round.

[14] The thickness and rating of each tranche is determined according to the tranche's default probability. A tranche is eligible for a specific rating if the tranche's default probability is lower than a predefined idealized default rate.

is neither certain nor expected by the markets that in case of a crisis – and that is the only relevant situation in which such a call will be made – all countries are able or willing to fulfill their commitments in full. These doubts about the willingness to fulfill their commitments in full – even currently – impedes a rating of the ESM of AAA by all rating agencies and induces refinancing costs significantly higher than e.g. the German government or other institutions considered (relatively) riskless creditors.

In our benchmark scenario, a big and a medium-sized euro area country, named Italy and Spain for expository purposes, request a total sum of 150bn€ of support in the form of a loan (*Instrument loan, Composition I,* see Table 1). Market participants are assumed to expect that ESM members to not provide any additional capital when called upon, that is, *expected callable capital* is nil.

Table 1: List of *compositions*

Composition	**Member State**	**Assumed yield on 10-yr government bond**	**Implied probability of default**	**Credit requested**
Composition I (benchmark)	Italy	4.54	6.31	100bn€
	Spain	5.34	7.67	50bn€
Composition II	Italy	4.54	6.31	100bn€
	Spain	5.34	7.67	50bn€
	Cyprus	5.33	7.65	20bn€
	Slovenia	7.00	10.37	10bn€
Composition III	Italy	4.54	6.31	200bn€
	Spain	5.34	7.67	100bn€

Note: The selection of Member States in this analysis serves for illustrative purposes (e.g. to cover for different characteristics such as big vs. small Member State).

Source: Model assumptions on the composition and size of credits and characteristics of beneficiary countries.[15]

Although ABS is commonly associated with both tranching and diversification, the core of ABS is only the efficiency gain by the tranching procedure. The diversification effects support and amplify the tranching effects. The higher the diversification the larger the AAA tranche and the higher the interest gains. Hence, ABS with a low number of assets as in our case, are nothing unusual in structured finance. In commercial real estate finance even ABS with a single asset are quite common, see e.g. the Hudson Yards financing by Deutsche Bank and Goldman Sachs issued August 2016, or previously the financing of the West End Plaza in Frankfurt am Main, the Mall of Berlin or the ECE-Shopping-Center Milaneo in Stuttgart.
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We first compare the refinancing costs of the current ESM and the alternative ABS scheme in the case of the two types of refinancing instruments, i.e. loan vs. secondary market purchase, under this benchmark scenario. In the next step, we evaluate how changes in the market-

[15] We use the yields of 10-year government bonds from S&P. The recovery rate of 50% on defaulted 10-year government bonds is based on estimations by Becker (2009) and Moody's (2010) and corresponds to the nominal write-down of private-sector involvement agreed upon in the case of Greece in 2012. To calculate the implied probability of default (IPD) of Member States asking for financial assistance we use the approach of Sturzenegger and Zettelmeyer (2006).

expected callable capital and the amount of credit sum affect the ESM. Finally, we assess the sensitivity of our results with regard to two main choices made in our benchmark scenario, the instrument variable and the composition of debtors. The instrument variable characterizes the type of financial support, i.e. loans or secondary market purchases[16] and the composition variable the composition of the group of beneficiaries and the amount of financial assistance provided. (See **Fehler! Verweisquelle konnte nicht gefunden werden.** for the different scenarios.) Compositions II and III increase the number of countries so as to analyze the diversification and timing effect and double the financial assistance to account for the volume effect.

Correlations and Contagion

Obviously, a central issue in this type of analysis is the potential for contagion between the participating countries. We allow for contagion effects between the debtor countries based on the strong interrelations between euro area economies due to similar economic developments, close trade relations, deep financial links, and a high probability of similar shocks and policy reactions.[17]

Since high correlations reduce the diversification effect of the debt portfolio and diminish the positive effects of an ABS structure, we devote special attention to the correlation assumptions. In contrast to most other multivariate distributions, the correlation of binary random vectors is mathematically limited and its potential range depends on the event probabilities (for a detailed discussion, see Bauer *et al*. 2008). Therefore, we take a conservative approach and set the correlations to the maximum possible value in each case.[18]

Table 2: Correlation matrix

	Slovenia	**Cyprus**	**Spain**	**Italy**
Slovenia	1	0.64	0.76	0.73
Cyprus	0.64	1	0.77	0.88
Spain	0.76	0.77	1	0.88
Italy	0.73	0.88	0.88	1

Source: Authors' model assumptions.

[16] In the Appendix, we discuss in greater detail the ESM's different instruments and also analyze a linear mix of loans and secondary market purchases. We find that the effects are linear in the partitioning on the different instruments.

[17] Arghyrou and Kontonikas (2010) show how Portugal, Ireland, and Spain have experienced contagion from Greece. Forbes (2012) differentiates between "interdependence" and "contagion" and shows in a regression analysis the implications for evaluating policies aimed at mitigating contagion.

[18] Binary random events can be perfectly correlated only if they have identical probability values. Since our country sample has different default probabilities and higher correlations decrease the diversification effect, we use the maximum possible correlation values for a most conservative estimation.

General Market Characteristics

The market conditions assumed in our simulations are based on the financial and economic situation in early 2013 (see Table 3). The average rating of euro area Member States is A (S&P), the average default probability of the 17 Member States[19] is around 5.6%. These default probabilities are assumed to be exogenous to the existence of the ESM as they are estimated based on non-crisis data from 1999 to 2009, the year before the Greek financial market problems emerged.

ESM borrowing rates are a function of the default probability and the risk appetite in the bond market. In our model, the ESM issues a standard 10-year bond, which is guaranteed by the paid-in capital of the 17 euro area Member States according to the capital key. This paid-in capital is reinvested at the assumed risk-free yield of 1.3%.

Table 3: Market characteristics

Market characteristics	
Maturity	10 years
Number of countries	17
Average rating	A
Average default probability	5.6 %
Assumed recovery rate	50.0 %
Assumed risk-free yield	1.3 %

Source: S&P, ECB, and authors' calculations and assumptions.

IV. Main Empirical Results

Qualitatively, the results of our simulations are as expected with respect to changes in the expected callable capital relative to the credit amount. Better (expected) ESM funding (i.e., more expected callable capital) implies a lower leverage ratio, better credit rating, lower interest rates, and, subsequently, better capitalization. However, this effect depends quantitatively on the composition of countries and the total credit amount.

The more important and innovative aspect of our analysis is that we can quantify these effects and thus answer key policy questions such as: How do rating and refunding costs of the ESM depend on market expectations and the choice of financial instruments? What are the costs of the ESM's targeted AAA status? Can we expect the ESM to have a stabilizing effect in times of crises? Our simulation analysis provides very interesting insights into the workings of the

[19] At the time when we run the simulations, Latvia and Lithuania were not yet euro area Member States and are therefore not part of the analysis. However, and inclusion of these two countries, does not alter the core findings of the investigation.

institutional features and their interaction in different economic scenarios. An illustration of some of the core results is given in Table 4 and Figures 2 and 3. In the following subsection we discuss the sensitivity of these simulation results with our benchmark scenario as a point of reference.

Benchmark Scenario

The benchmark scenario simulates the effects of (*Instrument*) *loans* to Italy and Spain with a volume of 100bn€ and 50bn€, respectively (*Composition I*). We assume that the market does not expect that any *callable capital* is provided by euro area members if requested by the ESM. It might come as a surprise at first sight, that the refinancing costs are quite low. The ESM can fund 90% of its financial support with an AAA-rated tranche even though expected callable capital is nil (see Table 4). However, note that the ESM has available 80bn€ of paid-in capital as collateral and the recovery rate in case of a sovereign defaults is assumed to be 50 %.

Table 4: Benchmark scenario: Italy 100bn€, Spain 50bn€, Instrument A, expected callable capital 0bn€

Refinancing tranches			Average ESM surplus after 10 years	Investors' loss probability	Expected tail loss
1	0.900	AAA	0.0bn€	3.8%	-8.1bn€
2	0.018	AA			
3	0.018	A+			
4	0.018	A-			
5	0.045	BBB+			

Source: Authors' simulation results.

The interest markup "margin" of 0.1% that the ESM demands over its refinancing cost is just sufficient to maintain ESM resources on average. The beneficiary countries profit from the lower interest rates offered by the ESM, namely, its refinancing costs plus the fixed margin. In the event of a joint default of both countries there is a small probability (3.8%) that ESM funds (paid-in capital, interest surplus, expected callable capital- and recovery) do not suffice to meet interest and repayment obligations. The investors' loss probability also depends on the time of the default since the ESM receives an interest surplus until the time of the default, which, in some cases, increases its funds just enough to avoid insolvency. The average damage investors face in the event of a loss is the expected return conditional on the event of a loss, i.e. $\int_{X<0} XdP$, where X is the investors' payoff with probability distribution P. This value equals the expected tail loss using the probability of a loss as confidence level

$av.\,loss = \int_{X<0} XdP = ETL_{\alpha=P(X<0)}$. In the base scenario, the investors' expected deficit in the event of a loss amounts to 8bn€. The average loss serves as a measure of the average value at risk whereas the loss probability describes the degree of risk.

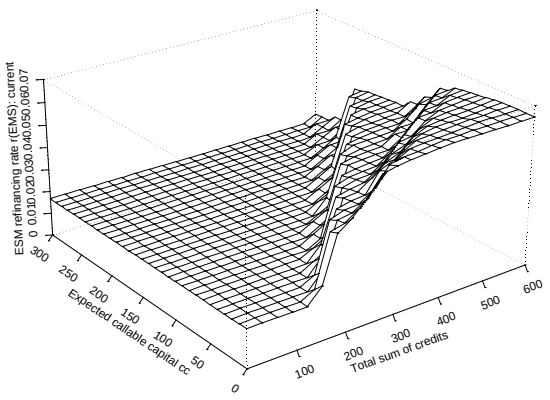
The ESM in times of crises

In designing the ESM, its shareholders decided to forego an ABS structure and instead to overcollateralize. This decision entails substantial costs, not only directly due to higher interest expenses, but also due to an increased vulnerability of the ESM in crisis situations. Our simulation methodology not only provides a straightforward instrument to quantify these direct funding costs but also to assess how the riskiness and thus the ratings of the ESM are likely to deteriorate in financially difficult times.

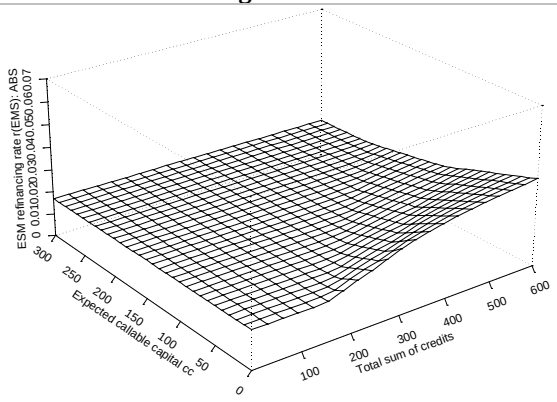
The effects of changes in total credit and expected callable capital are not linear. We analyze in the following how funding costs depend on the refinancing design in a Markov Chain Monte Carlo (MCMC) setting where we simulate over the entire grid of possible values for both variables. The funding costs depend in a complex and recursive way on the amount of total credit relative to market-expected callable capital and paid-in capital. Both effects have a strong impact on the ESM funding rate and thus on the ESM's potential to generate profits on behalf of its members and/or beneficiaries. If in times of crises expected callable capital deteriorates the rating of the ESM with the current refinancing structure drops and imposes high costs on members and/or beneficiaries. In contrast, the ABS refinancing structure is much less sensitive due to the tranching effect.

Figure 2 illustrates how ESM funding rates (r_{ESM}) dependent on the total amount of ESM credits (C) and the market expectations of callable capital (cc) for the two funding designs – (a) the current ESM and (b) our ABS proposal. The analysis is based on our benchmark scenario with two beneficiary countries, Italy and Spain, under the loan instrument. We modify the benchmark scenario by varying total credit from 0 to 600bn€, with Italy always holding two-thirds of the debt, and by varying expected callable capital between 0 and 300bn€. While the analysis in the previous section compares pairs of scenarios at a time in greater detail, we now graphically examine all combinations of total credit and expected callable capital simultaneously with the ESM refinancing rate as a catch-all variable.

Figure 2: ESM interest rates of conventional and ABS-structured refinancing



(a) ESM interest rates without ABS-structured refinancing



(b) ESM interest rates with ABS-structured refinancing

Source: Authors' simulation results.

For the conventional, non-ABS case, the ESM refunding has a single rating of AAA as long as the credit volume stays below the sum of realized and expected paid-in capital as well as the recovery. If the credit sum increases further and/or market confidence decreases, ESM refinancing costs jump dramatically when it does not justify the AAA rating anymore due to the deteriorated credit/confidence ratio. The first increase is to roughly 4.5% and then to as much as 6.5% in the extreme case of full lending of 500bn€ and nil expected callable capital (see Figure 2a).[20] The advantage of ABS structuring stems from maximizing the low-risk/low-cost share of the refinancing. The amount covered by (realized and expected) paid-in capital and recovery is always AAA. Additionally, the amount of callable capital that markets expect to be provided by ESM members in case of a margin call is also AAA. Only the remaining risky part has to be refinanced more expensively. If total credit increases or market confidence decreases, ABS refinancing costs increase slowly but continuously (see Figure 2 b) as the higher risk and interest rates only gradually increase the share of riskier higher interest rate tranches. In both cases, the marginal refinancing costs are progressive and increase nonlinearly with total credit size.

Figure 3 shows the interest advantage of ABS-structured refinancing, that is the difference between refinancing rates of the current and an ABS-funded ESM as shown in Figure 2. As

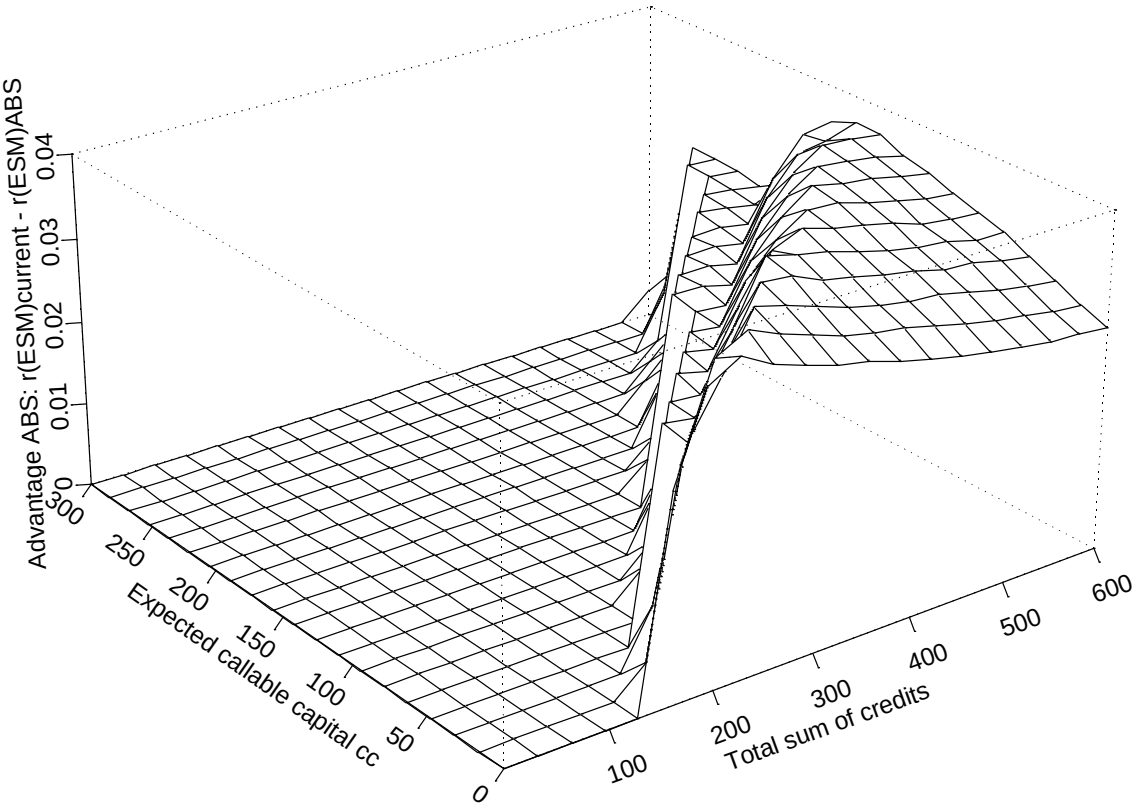
[20] Since our baseline scenario consists of two debtor countries, we observe two potential downgradings. The first occurs if expected repayments are less than the level necessary for an AAA rating. Since the entire institution is rated, the risk to fail one repayment determines the entire rating. The rating falls to the degree determined by the expected probability of insufficient repayment, which is determined by the debtor countries' risk, moderated by interest surpluses due to timing of default events. Obviously, the higher the total credit the higher the required expected callable capital to avoid the downgrading. The second downgrading marks the risk of a default of both countries.

long as total credit is below expected capital, i.e., paid-in capital plus expected callable capital plus recovery the ABS funding obviously does not have has any interest advantage. The advantage of an ABS structure becomes apparent when the credit volume starts to exceed expected capital. Non-ABS refinancing costs jump to 4.5%, while ABS refinancing costs slowly increase to 2%, yielding an advantage of roughly 2.5%. At the second downgrading line, the ABS advantage jumps to 3.5% (see footnote 17 for the determinants). Beyond this jump, further increasing total credit and/or lowering market confidence reduces the advantage of the ABS structure as the relative size of the AAA tranche shrinks.

It might be noteworthy that credit volumes of 600bn€ and more can be financed with an AAA rating in the extreme case of very high market trust, i.e. if markets expect more than 300bn€ to be provided by ESM members if called upon in the event of a loss. Realistically however, expected market confidence is likely to be much lower - not even under the current credit line of 500bn€ does the ESM attain an AAA rating by all major rating agencies. Thus, the ESM would considerably profit from an ABS structure even under current conditions.

Our analysis indicates a substantial danger for the current euro area crisis resolution mechanism, as the severity of future crises is very likely to increase once a certain threshold is reached due to the mechanisms of self-fulfilling prophecies. Currently the ESM is motivated and promoted as a stronghold against capital flight and liquidity problems. However, if in times of crises expectations on callable capital deteriorate, the ESM will be downgraded and subsequently market expectations will worsen further. As a result, any ESM downgrading in a crisis is likely to lead to a self-enforcing loss of trust and further downgradings by the rating agencies which further fuel the crisis. These effects were visible in the aftermath of the ESM downgrading by Moody's on Nov. 30th 2012, when CDS rates spiked again even though the peak of the financial crisis had long been passed.

Figure 3: Interest advantage of ABS-structured refinancing



Source: Authors' simulation results.

Thus, our simulation results draw a rather dire picture of the ESM suitability as a bastion of calm in times of crises. The ESM credibility and thus its potential to stabilize financial markets is under severe threat particularly in the type of crisis situations most likely to occur in the future, namely with moderate claims of beneficiary countries under economic stress while ESM shareholders might be increasingly unwilling or unable to provide additional capital when called upon. In these situations, e.g. loan demands of 300bn€ with expected callable capital limited to 80bn€ ESM funding costs increase by 2.5% with the rating concomitantly deteriorating to a mere BBB. Such a downgrading in a crisis situation is likely to negatively feedback on market expectations, with the ESM ultimately acting as a crisis accelerant. In contrast, the comparative advantage of the proposed ABS approach should become apparent in this type of moderately severe crisis. With the onset of such crises the riskiness of such a structure and thus its funding costs increases only gradually (see Figures 2b and 3).

V. Sensitivity to choice of instruments and debtors composition

Qualitatively, the results of our simulations with respect to changes in the *instruments* and *composition* are as expected. Secondary market purchases imply higher interest revenues for the crisis resolution mechanism compared to direct lending via loans and thus smaller advantages for the beneficiary country. The financing capacity for new applicants is smaller the larger the volume of programs already in place; however, the quantitative and qualitative effects of this restriction depend on total credit volume and on the composition of countries, since a larger number of debtors increases the beneficial diversification effect.

We quantify these effects for an ABS-funded ESM with respect to our benchmark scenario in order to assess the sensitivity and reliability of our results. Tables 5 to 7 summarize some core results.

Instrument Effect

Table 5: Instruments loans vs. secondary market purchases, Italy 100bn€, Spain 50bn€, expected callable capital 0bn€

Instrument	Refinancing tranches			Average surplus in ESM after 10 ys	Investors' loss probability	Expected tail loss
loan (benchmark)	1	0.900	AAA	0.0bn€	3.8%	-8.1bn€
	2	0.018	AA			
	3	0.018	A+			
	4	0.018	A-			
	5	0.045	BBB+			
Secondary market intervention	1	0.911	AAA	43.9€	1.2%	-9.7bn€
	2	0.048	AA			
	3	0.041	A+			

Source: Authors' simulation results.

Financial support via secondary market purchases leads to higher interest gains for the ESM compared to loans (see Table 5). In the benchmark (loan) scenario, the ESM receives only a small service fee which is added to its refinancing rate. In the case of secondary market purchases, the spread between debtors' market rates and the ESM refinancing rate stays with the ESM. The beneficiaries profit only from a liquidity effect: the additional demand by the ESM on the bond market lowers the beneficiaries' interest rate and helps to avoid excessive interest hikes as seen in the recent financial crisis.

Under secondary market interventions ESM funds available after a period of 10 years increase on average by around 44bn€.[21] For investors, the moderate loss probability is reduced from 3.8% to 1.2%, whereas the expected tail loss increases slightly to 9.7bn€. The structuring of the tranches benefits from small positive second-round effects compared to the benchmark scenario. The additional profits from the interest spread increase the ESM's financial buffer, thereby lowering investors' risk of a default, improving the rating of the tranches, and subsequently further reducing refinancing costs.

Composition Effect: Volume and Timing

Table 6: Composition of credits: Increasing the number of debtors and the credit sums, expected callable capital 0bn€, instrument loans

Composition of credits	Refinancing tranches			Average surplus in ESM after 10 ys	Investors' loss probability	Expected tail loss
(I) Total 150bn€: Italy 100bn€, Spain 50bn€ (benchmark)	1	0.900	AAA	0.0bn€	3.8%	-8.1bn€
	2	0.018	AA			
	3	0.018	A+			
	4	0.018	A-			
	5	0.045	BBB+			
(II) Total 180bn€: Italy 100bn€, Spain 50bn€, Cyprus 20bn€, Slovenia 10bn €	1	0.768	AAA	-1bn€	5.9%	-24bn
	2	0.022	AA			
	3	0.022	A+			
	4	0.042	A-			
	5	0.042	BBB+			
	6	0.062	BBB			
	7	0.040	BBB-			
(III) Total 300bn€: Italy 200bn€, Spain 100bn€	1	0.469	AAA	-6.6bn€	8.0%	-99bn€
	2	0.033	AA			
	3	0.033	A+			
	4	0.066	A-			
	5	0.058	BBB+			
	6	0.087	BBB			
	7	0.255	BBB-			

Source: Authors' simulation results.

A larger demand for financial support increases the structure's risk. If the larger credit sum is backed only by the original paid-in capital of 80bn€, tranching worsens and investor risk increases. Doubling the credit sums of the benchmark scenario to 200bn€ for Italy and 100bn€ for Spain (*Composition III*) reduces the AAA tranche to 47% (Table 6). ESM refinancing costs increase by 2%, diminishing the positive effects for the recipient countries. The rise in ESM income from the increased credit volume is not sufficient to cover the beneficiaries' default risk: after 10 years the fund loses 6.6bn€ on average. Investors' default risk also rises

[21] The second-round effects from the enhanced tranching amount to around 2bn€ and are of a magnitude smaller than the interest spread profits.

considerably as the loss probability jumps to 8% and the expected tail loss to almost 100bn€. Two effects are responsible for this deterioration. First, defaults on such a large scale cannot be covered by ESM equity only (in this scenario we still assume that markets expect no callable capital) and lead to a direct loss for the investors. Second, we assume a very high default correlation to account for potential contagion effects, which implies a very high number of simultaneous defaults, which then overburden ESM resources.

Alternatively, we simulate a smaller increase of total credit by adding two small beneficiary countries (named Cyprus and Slovenia for expository purposes) and find similar but weaker effects (Table 6). In this scenario, however, the negative effects are slightly dampened by the improved diversification of the credit portfolio. Although the total credit volume increases by 20% relative to the benchmark (as compared to 100% in the scenario before), the expected tail loss rises by 16bn€ only (as compared to 93bn€) and refinancing costs rise by 0.5%.

The structure of the ESM is also not neutral with respect to the timing of financial support. Potential debtors have an incentive to make early requests for support when financial assistance is provided via loan.[22] The later a Member State requests financial support and the more financial assistance the ESM is already providing to other countries, the more likely it is that the costs for the additional recipient country rise. If market-expected callable capital is low, the ESM's financing costs increase,[23] the credit quality of ESM bonds deteriorates, and credit ratings are downgraded. These higher costs are passed on to the most recent beneficiary country.

ABS refinancing has the advantage of a higher and more flexible lending capacity but is also subject to similar timing effects. While the first beneficiary benefits from the entire expected equity, later applicants profit only partially because they have to share the security buffer provided by ESM collateral and obtain a smaller AAA tranche. In contrast, ESM's current non-ABS structure strictly limits lending capacity to 500bn€, which has the advantage that the financial conditions for potential debtors do not depend on the timing of their request as long as the ESM's rating does not change. However, as demand for ESM support is likely to increase in times of crises, investors risk rise as do interest rates.

[22] If support is provided via secondary market purchases this effect does not hold, as the Member States pay the same yields to the ESM as they would on the secondary market.

[23] To gauge this effect we compare the results of the scenarios with 150bn€ and 180bn€. In the first case, 135bn€ out of the 150bn€ could be financed by the ESM with the issuance of an AAA bond. If at a later time two additional countries request assistance, only 2bn€ of the additionally requested 30bn€ could be issued as AAA bonds, and the ESM would have to refinance 28bn€ at a higher cost.

Callable Capital Effect

To assess the relevance of market expectations and to give a better insight into the underlying interest rate effects we compare two extreme cases in a scenario in which of 300bn€ credit (*Composition III*) are provided in the form of secondary market interventions: complete distrust and full trust, that is, the expectation that callable capital is not provided at all, respectively as requested.

Table 7: Expectations on callable capital and large credit demands: Italy 200bn€, Spain 100bn€, secondary market purchases

Expected callable capital	Refinancing tranches			Average profits in ESM after 10 ys	Investors' loss probability **before** callable capital	Expected tail loss **before** callable capital	Investors' loss probability **after** callable capital	Expected tail loss **after** callable capital
0bn€	1	0.522	AAA	50.5bn€	7.1%	-73.5bn€	7.1%	-73.5bn€
	2	0.048	AA					
	3	0.047	A+					
	4	0.047	A-					
	5	0.140	BBB+					
	6	0.092	BBB					
	6	0.118	BBB-					
620bn€	1	1	AAA	84.5bn€	1.7%	-58.5bn€	0%	0

Source: Authors' simulation results.

In the first scenario with secondary market purchases as instrument, total credit total of 300bn€, and market expectation that no called capital is provided, the interest gains cumulate over the credit period to an average surplus of 50bn€ (Table 6). The probability of a need to call additional capital is about 7% and, on average, 73bn€ would be called. Under the assumption that markets do not expect any capital injections, this equals the investors' expected tail loss.

Whenever expectations about callable capital improve, investors' expected risk declines, which leads to a better tranching and lower refinancing costs. In the high-trust scenario, the ESM issues a single AAA tranche, implying a refinancing cost of only 1.7% and yielding an average profit of 84.5bn€, i.e. roughly doubling current ESM funds. The better market sentiments and improved funding costs add up to considerable savings: Average profits of the ESM improve by 34bn€ on average after 10 year, the probability of having to call fresh capital shrinks to 1.7%, and average amount to be called to 58.5bn€. Obviously, if callable capital is provided in full, investors' risk and tail loss are nil as the fresh capital covers ESM losses.

This effect also holds for the other scenarios in a qualitatively similar way and these results underline the obvious: the more financial support is provided by the ESM, the greater the amount of expected callable capital that is needed to ensure a high rating.[24]

VI. Robustness Check

Our simulation results are generally robust to changes in the model setup, specifically to the assumptions on default correlations or the recovery rate. Typically, these changes give the qualitatively expected results. The effects of lower default correlations, a larger margin for the ESM, and a smaller recovery rate are discussed below in more detail.[25]

We have halved the assumed correlations of default events between euro area countries in all scenarios. Hence, defaults are less likely to appear simultaneously and therefore higher interest spread profits for the ESM are expected, an effect that is confirmed by the simulation. However, this effect is very weak. In our benchmark scenario, the refinancing rate decreases from 1.85% to 1.75%, and risk and expected tail loss differ insignificantly.

Increasing the ESM's margin r_{margin} is a means of distributing the spread between the two extremes: the loan instrument, which puts the spread on the beneficiaries side, and the secondary market intervention, where the spread remains at the ESM. Naturally, a higher margin increases ESM funds, leads to a better tranching, and reduces investor risk. A margin of 1% leads to an average ESM surplus of 12bn€ after the credit period, an improvement of the refinancing rate of 0.04%, and a reduction of investor risk from 3.8% to 2.8%.

Changing the recovery rate[26] also affects interest spread in a straightforward way. A lower (higher) recovery rate leads to lower (higher) expected payments in case of a default, which implies higher (lower) expected losses in the ESM structure, making ESM bonds less (more) attractive. Specifically, we decrease the recovery rate from 50% to 30%, so that in the event of a default, only 30% of the notional is received immediately after the default and then reinvested at the risk-free yield. Decreasing the recovery rate makes the model assumptions more conservative in the sense that we expect lower payments in the event of a sovereign

[24] The ESM's rating also depends on its shareholders' ratings. For example, if a Member State is downgraded, market participants are likely expect that the probability declines that this Member State fulfills its commitment when called to provide additional capital.
[25] Extended simulation results can be obtained from the authors upon request.
[26] Note: A decrease of the recovery rate also reduces the default probabilities of the participating countries and leads to an adjustment of the assumed correlations.

default. This leads to a worse tranching and subsequently lower interest gains and higher expected losses if the default is realized, which is again confirmed by the simulation. Applied to our benchmark scenario we obtain an average loss to the ESM of 6bn€ and the refinancing interest rate increases by 1%. Investor loss risk increases from 3.8% to 7% and expected tail loss from 9 to 39bn€.

Finally, note that expected callable capital may have a strong impact on the tranching, especially in close cases. For example, in our benchmark scenario an expected callable capital of 13bn€ would lead to a single AAA tranche.

VII. Conclusions

The recent financial crisis made it painfully obvious that the euro area still lacks effective methods for crisis prevention and crisis management. During the crisis, several temporary crisis resolution mechanisms were established, but eventually proved to be insufficient. Since 2012, the ESM is the permanent crisis resolution mechanism for the euro area. It comes as no surprise that the design of the ESM is far from optimal as it was created in crisis mode under immense time pressure in an environment marked by extreme political and economic stress.

We analyze and compare the costs of the current (suboptimal) design of the ESM and an alternative ABS structure under different scenarios. We find that the current ESM to have two major shortcomings: (I) it is likely to destabilize financial markets in times of crises and (II) it is more expensive that necessary.

A crucial determinant of ESM costs is the relative size of financial support and market's expectation about the callable capital that ESM members have committed to provide in case of ESM losses. This additional capital is most likely requested in times of crises, meaning that markets might have rather gloomy expectations as to the ability and willingness of ESM members to actually fulfill their commitments. Our simulation results indicate that the advantages of the ABS structure are highest in such crisis situations. Instead of providing stability as a bastion of calm the ESM is likely to act as a crisis accelerant in times of economic crisis. The current ESM design is likely to act as a distrust multiplier. Downgradings or just discussions about potential downgradings might signal deteriorating expectations, thereby starting a herding type downward spiral. This implies rather abrupt jumps in riskiness and funding costs with ESM rating plummeting. In contrast, ABS

refinancing is much more robust to crisis situations. Funding costs increase steadily, while the deteriorating market conditions are at first picked up by the lower rated tranches.

We also find that moving to an ABS structure could considerably lower ESM funding costs and increase benefits for all participants. ABS refinancing minimizes losses for the total system while at the same time being relatively robust against deterioration of market expectations. The advantage of an ABS approach with respect to refinancing interest rates ranges between nil if financial support is below total expected ESM capital including recovery, and 3.5%, if expectations deteriorate. The distribution of this larger "cake" among the participants depends critically on the type of financial support the ESM provides. The choice of instruments – direct loans or secondary market purchases – affects the distribution of costs and thus political economy considerations of redistribution and risk sharing between ESM members in their role as owners and (potential) clients. Financial assistance via loans is more advantageous for the borrowers as the ESM charges only a small margin on top of its refinancing costs. Also, from a political economy point of view, direct loans seem to allow putting more pressure on the beneficiary country to enact reforms as the interest advantage is passed through to the debtor. In contrast, secondary market purchases leave the interest gain within the ESM and leave less room for demanding reforms. Additionally, ABS refinancing allows higher lending levels than the current maximum of 500bn€. Taken together, there is much to be gained from rethinking and reforming the current ESM – and the current relatively calm times in financial markets are the right time to begin this process.

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