IMPACT OF VARIATION MARGINING ON EU INSURERS' LIQUIDITY: AN ANALYSIS OF INTEREST RATE SWAPS POSITIONS[49] [50]

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ABSTRACT

Insures use derivatives to hedge risks from investments portfolios and underwriting, but this exposes them to liquidity risk. This study uses Solvency II reporting data to assess to what extent European (re-)insurers would be able to meet potential variation margin calls on interest rate swaps portfolios. Interest rate swaps pose the largest share of (re-)insurers derivatives' portfolios. We consider several shifts to the yield curve, calculate the corresponding variation margin calls, compare them to liquid assets available to insurers and derive the potential liquidity shortfalls. Our results reveal that there may be a liquidity risk for (re-)insurers stemming from the use of derivatives, in particular interest rate swaps (IRS). This reflects both high IRS exposure and insufficient holdings of cash and liquid assets. Based on the analysis presented in this article we conclude that some insurers have not yet adapted their asset allocation and liquidity management practices to the (new) requirements on margining practices which have been introduced as part of the OTC derivatives reform.

49 An extended version of the underlying analysis and policy implications will appear in forthcoming ESRB publications.

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51 European Insurance and Occupational Pensions Authority (EIOPA). The work was carried out during her secondment to the ESRB Secretariat.

52 European Insurance and Occupational Pensions Authority (EIOPA).

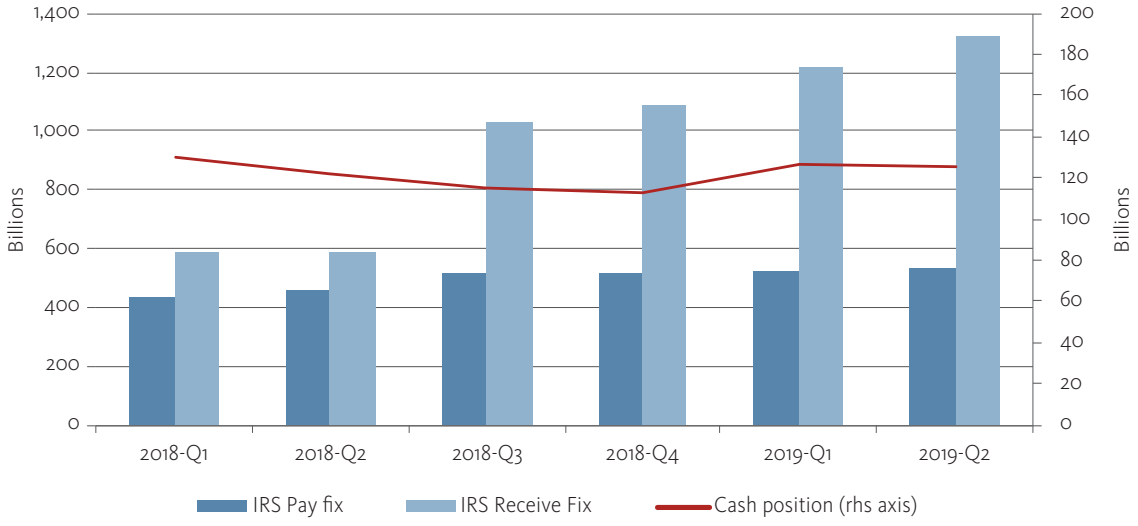
53 European Central Bank (ECB). Disclaimer: This paper should not be reported as representing the views of the European Central Bank (ECB). The views expressed are those of the authors and do not necessarily reflect those of the ECB.

INTRODUCTION

Derivatives exposures of insurance companies came into the spotlight after the near-failure of the global insurance conglomerate, American International Group (AIG). This group was rescued at the height of the financial crisis because of the significant losses on the credit default swap (CDS) portfolio held by its Financial Products Subsidiary. Beside the dramatic change in market value of the protection sold, one of the main aspects of the near-failure was a liquidity shortfall in managing collaterals. When AIG's credit rating was lowered collateral provisions kicked in and AIG suddenly received massive margin calls[54]. Since then, derivatives exposures of insurers have been considered as a potential risk to financial stability.

Recent studies[55] on European insurers have shown that their aggregate derivatives holdings are small. Specifically, the market value of all derivatives positions amounts to only ca. 1% of total investments. Nevertheless, there are a number of companies with sizeable exposures. Moreover, the notional amount of interest rate swaps (IRS) – which represent the largest class in insurers' derivatives portfolios – has been steadily rising since the beginning of 2018. In particular, the amount of IRS where insurers receive fixed rate has more than doubled since then, see Figure A2.1. While European insurers use derivatives to hedge risks from investments portfolios and underwriting, their derivative holdings can also expose them to higher liquidity risk, which is the focus of this study.

Figure A2.1: Notional amounts (EUR) of interest rate swaps and cash holdings of EEA insurers



Source: EIOPA SII QRT data
Reference date: Q4 2018

54 On September 15, 2008, the day all three major agencies downgraded AIG to a credit rating below AA-, calls for collateral on its credit default swaps raised to $32 billion a huge change from $8.6 billion in collateral calls just few days earlier.

55 EIOPA (2018); Fache Rousova, L. and E. Letizia (2019).

In the aftermath of the financial crisis, the need for reducing counterparty credit risk became apparent. This has been addressed by introducing new rules. The European Market Infrastructure Regulation (EMIR)[56] has, in particular, introduced the requirement to centrally clear the most commonly used types of derivatives contracts and to exchange collateral in the form of margins for both bilateral and centrally cleared transactions. These requirements aim to make the financial system safer by protecting participants from counterparty credit risk.

This study focusses on the exchange of 'variation margins' (VM). These reflect the change in market value and portfolio composition of the contracts of a company. Since VM calls have to be typically paid at a short notice (e.g. overnight or even intra-day), the cash position plays a central role as cash is the most widely used instrument to meet these calls owing to its fungibility (regardless of whether the contracts are centrally cleared or not). However, despite the rapid increase in insurers' holdings of IRS, the aggregate cash position of EEA insurers has remained stable since the beginning of 2018 (see Figure 1).

Against this background, this article investigates the liquidity risk faced by EAA insurers from the need to pay VM on their IRS exposures. Using Solvency II data on contract level, we first apply a parallel positive shift to the level of interest rates, calculate the corresponding variation margin calls on insurers' portfolio of interest rate swaps and compare them to different liquid assets available to insurers. In this way, we derive any potential liquidity short-falls. To assess the sensitivity and robustness of our results, we consider a range of interest rate increases and various measures of liquid assets.

Overall, we observe liquidity shortfalls for almost all combinations of interest rate shifts and liquid assets. Considering all set-ups, the aggregate estimated liquidity shortfalls for the EEA insurers in our sample implied by the variation margins calls range between EUR 1bn to almost EUR 90bn. These estimates are sizeable compared to the overall Solvency II value of plain vanilla interest rate swaps held by the companies in our sample (i.e. Q4-2018), which totalled EUR 22.5bn. By the same token, they are sizeable compared to the initial liquidity positions of these companies (EUR 21bn – EUR 740bn) and also to their average open positions in the repo market (EUR 50bn of cash borrowing and EUR 15bn of cash lending on average during 2018). On the other hand, the figures are small compared to the overall size of total investment of the companies in our sample, which stands at around EUR 4.8trn.

This article is structured as follow. Section 2 describes the data and the methodology used in this study. Section 3 presents the results. Finally, Section 4 concludes.

METHODOLOGY

This section describes the regulatory background for margining practice, the data used, the pricing of the IRS positions and the set-up of the analysis.

REGULATORY BACKGROUND FOR MARGINING PRACTICES

Recently introduced regulatory requirements have changed the risks associated with derivatives transactions from counterparty credit risk to liquidity risk. The European Market

56 ADD reference to EMIR.

Infrastructure Regulation (EMIR) requires the most commonly used types of derivatives contracts (incl. IRS)[57] to be centrally cleared[58]. (Re)insurers that have a gross exposure of more than €3 billion in OTC interest rate derivatives will be mandated to clear[59]. Counterparties below this threshold are exempted from clearing obligations, but could be still required to meet them bilaterally. Non-centrally cleared derivatives are subject to specific requirements on margins[60]. Bilateral counterparties above specific thresholds are mandated to exchange daily variation margins and to post initial margins to each other.

Whereas all counterparties are subject to exchange of variation margins since March 2017, there is a phase-in scheduled for the obligation to exchange initial margins[61]. As of the 1 September 2019 the requirements apply to all cases where both counterparties have, or belong to groups each of which has, an aggregate average notional amount of non-centrally cleared derivatives that is above €750 billion; this threshold will be lowered to €8 billion from the 1 September 2020. Regulation admits the possibility of exchanging non-cash variation margins for non-centrally cleared derivatives. Unlike for cleared derivatives, the regulation allows to collateralise the exposure from variation margin calls with non-cash collateral. Although the evidence on non-cash variation margin payments is scarce, this option could be attractive for asset rich but cash poor insurers.

The above margining requirements only apply to new trades concluded after the applicable phasing in deadlines. It will therefore take time before new trades replace all the legacy trades which are not covered by the requirements.

DATA

This study employs quarterly reporting data for solo undertakings in Q4-2018[62]. This was the most recent data at the time when the analysis has been implemented. The sample includes derivatives held directly, not considering exposures via collective investment funds.

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57 The clearing obligation under EMIR comprises certain classes of interest rate and credit OTC derivatives, which have to be cleared by authorised or recognised CCPs. For instance, (a) fixed-to-float interest rate swaps denominated in EUR, GBP, JPY, NOK, PLN, SEK and USD and (b) several series of credit default swaps denominated in EUR are subject to the clearing obligation. The details of the derivatives under the clearing obligation are listed in "ESMA's Public Register for the clearing obligation under EMIR. ESMA Public Register for the clearing obligation under EMIR; available at https://www.esma.europa.eu/sites/default/files/library/public_register_for_the_clearing_obligation_under_emir.pdf, last updated: 6 December 2018

58 As a result of the clearing obligation, counterparties (including (re)insurers) need to gain access to a qualified CCP, either becoming a direct clearing member, or more commonly becoming a client to a clearing member which also provides indirect clearing service. Once clearing arrangements are in place and contracts are being cleared, counterparties become subject to the requirement to post cash to cover the CCP from the replacement costs in the case of their own default (initial margins) and following the daily revaluation of their positions (variation margins).

59 EMIR Refit introduced article 4(a) introduced the category of small financials, i.e. counterparties with gross notional below the clearing threshold as specified in article 10(4)(b). Small financials are not subject to the clearing obligation, but remain subject to both the reporting obligation and the risk mitigation techniques for derivatives not cleared by a CCP under article 11.

60 For detail of risk mitigation techniques applicable to non-centrally cleared derivatives see EMIR Article 11 and the related Commission Delegated Regulation (EU) 2016/2251: https://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX:32016R2251&from=EN

61 For details on the phase-in schedule see article 36 of the Commission Delegated Regulation (EU) 2016/2251.

62 The Solvency II Directive (amended by the Omnibus II Directive), became fully applicable to European (re) insurers on 1 January 2016. Since the implementation of the Solvency II, (re)insurance solo undertakings and groups are required to report to national competent authorities on an annual and quarterly basis, for both prudential and financial stability purposes. This information is stored in EIOPA's Central Repository, i.e. the database that collects all data from Quantitative Reporting Templates (QRTs). Aggregated information derived from EIOPA's Central Repository is also made available on EIOPA's website. Besides, the SII data has been used by EIOPA for the conduct of its tasks. This is, however, the first time that the dataset has been used for joint research and policy making purposes within the ESFS framework.

Out of the 1,970 solo insurance companies that submitted (list-of-derivatives) data in Q4 2018, 224 reported positions on interest rate swap (IRS) derivatives. Those companies reported 43,429 individual contracts, for a total a notional amount of EUR 1.8 trillion.

After data cleaning (see Annex), the data set contains 34,689 contracts by 170 companies. The sample is dominated by large and very large[63] life insurers. These companies held 4.8 Trillion euro in total investments[64], i.e. 46% of the total of 10.5 trillion held by EEA insurers as of 2018 Q4.

Further details on the data cleaning and composition of the sample are included in the Annex.

RE-PRICING METHODOLOGY

In the section, we describe how we evaluate and compare the change in IRS positions values before and after the shift of the level of the interest rate. In a first step, we invert the pricing formula to extract the fixed rate (this is not reported under SII) from the market value of each IRS contract reported by insurers. In a second step, we calculate the market value of each derivative contract after the shift of the level of the interest rate.

Our analysis is focused on plain vanilla IRS. This is a contract in which one party agrees to pay (receive) cash flows equal to interest at a predetermined fix rate on notional principal for a certain number of years. In return, it receives (pays) an interest at a floating rate. An IRS is worth zero at origin when it is negotiated. After some time its value may be positive or negative depending on interest rate movements and the direction of the exposure.

To calculate the market value of an IRS, several pieces of information are needed: the discounting curve, and the direction of cash flows, their size, their payment schedule.

We use the EIOPA monthly risk-free term structure of spot rates[65] as discounting curves. However, to be consistent with market valuation, the EIOPA rates are considered only up to the last liquid point, after which the curve is assumed to be flat.[66] The specific curve used depends on the contract's currency.

The type of IRS contract determines which of the two parties is the fixed-rate payer (and floating rate receiver), i.e. the side in the swap. In principle, if an insurer is a floating rate payer and fixed rate receiver (i.e. "receives fix") it, uses the IRS to extend the duration of the assets, most likely to closer match the duration of the liabilities (i.e. to hedge the interest rate exposure on the liabilities side). Differently, if an insurer is a fixed rate payer and floating rate receiver (i.e. "pay fix") it, uses the IRS to hedge the interest rate exposure on the asset side.

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63 To classify companies according to their size we rank of all companies in the QRT data according to their total assets. We denote as large companies, those that have total assets above EUR 1.6 billion, and very large those above EUR 8 billion in total assets.

64 Rather than "total assets", in the insurance context "total investments" is typically a figure widely used. For example, it is used as the denominator for calculating statistics such as the split of investments. In Q4-2018 total assets is 11.2 Trillion EUR, while total investment is 10.5; these two figures are very close.

65 We use the *EIOPA monthly risk-free term structure of spot rates* without Volatility Adjustment (VA) and with the Credit Risk Adjustment (CRA) added back.

66 This is different from the approach used for the calculation of capital requirements under SII regulation, in which case the curve converges to the ultimate forward rate defined in the SII regulation after the last liquid point.

The size of cash flows depends on three variables: the fixed and floating rates, and the notional amount. The fixed rate is not reported under SII. We obtain it by inverting formula that equates the market value (SII value) of the IRS observed in the derivatives template (S.08.01) at the reporting date. If its value is outside a tolerance level (-5 to 10%) then it is set to a default value of 2%, which is approximately the average in the sample. In line with the discounting approach we use, the floating rate is derived from the EIOPA term structure for a specific currency (amended after the last liquid point). The notional amount is available from SII reporting and is used to compute the cash flows to be exchanged at interest payment dates.

The maturity and the swap payment frequency determine the total number of cash flows and the schedule when they are exchanged. In line with common market practice, the payment frequency is assumed to be twice per year and both legs are assumed to have the same payment frequency. The maturity determines the time span over which cash flows are exchanged.

We apply the pricing methodology where the IRS is evaluated as a portfolio of forward rate agreements (FRAs). The steps are the following: a) calculate the present value of the cash flows of the fixed leg, b) calculate the present value of the cash flows of the floating leg and finally c) obtain the value of the IRS as the difference of the two legs. The implementation of the pricing formula in our paper is a simplification of most widely used formulas.[67] First, it allows only for parallel shifts of the risk-free rate curve. Second, our implementation uses the EIOPA's term structure to derive both the discount factor and the floating rates. These approximations would not be sufficiently accurate for trading, but our model provides a materially correct assessment of changes in market values under shifts in interest rates.

SET UP OF THE ANALYSIS

In this section, we describe how we analyse whether insurers' liquidity is sufficient to cover variation margin calls following the re-pricing of their IRS portfolio. An insurer receives a variation margin call when the market value of its IRS derivative portfolios decreases. One company may receive and send several margin calls depending on the number of counterparties and portfolios. To assess if it holds sufficient liquidity to meet such calls we make several assumptions regarding

1. the type and size of market movement;
2. which contracts contribute to the margin calls;
3. how contracts are aggregated and netted in portfolios;
4. which assets can be employed to cover such margin calls.

We consider parallel upward shifts of the reference curves. Typically, insurers set up IRS positions so to receive the fixed rate and pay floating. They are therefore likely to be more vulnerable to margin calls in the case of an increase in interest rates. In our exercise, the risk free rate curves for all currencies[68] shift simultaneously and for the same amplitude. We consider parallel shifts of 25 50, 75 and 100 basis points (bps). Historical data (see Table A2.1) show that a movement of 25bps in a day is not unprecedented; we therefore depict a 25bp increase a "one-day correction". Larger movements may be more unlikely to observe in a single day, but can represent a continued period of market tur-

67 See for example Hull, J. Options, Futures and other derivatives (8th edition, pp 160-164)

68 Curves are identified by the currency of the contract, i.e. we assume to have only one curve for each currency.

moil over several days; we in particular focus on a movement of 75 bps, which we define as a "prolonged market turmoil".

Table A2.1. Quantile distribution of changes in 1Y EUR OIS rate during periods of 1,5 and 10 days between January 2005 and July 2018 as an example of floating rate dynamics.

1y OIS rate changes [bps]	1 day	5 days	10 days
min	-26	-48	-90
25th percentile	-1	-2	-3
median	0	0	0
75th percentile	1	2	3
max	27	35	37

Source: Bloomberg

We assume that all derivatives contracts in insurers' portfolios are collateralised by variation margins. We do not distinguish between cleared and uncleared trades for two reasons. Firstly, in Solvency II reporting it may be difficult to distinguish these two groups because of data reporting requirements and data quality issues. Secondly, for cleared contracts insurers would receive the margin call from the clearing member, with timing and modality more similar to bilateral trades.[69]

We consider the two extreme cases of no and full netting. Variation margins are computed on a portfolio basis and positive and negative contributions within a portfolio offset. A pair of counterparties may have several portfolios (also referred to as netting sets), but usually contracts of a certain type (e.g. interest rate derivatives) in the same currency are grouped together in one portfolio. The information on the composition of the netting sets is however not available in Solvency II reporting. Therefore, we opt for the two extreme cases. On the one hand, the *full netting* configuration represents an insurer trading only one type of contract with one counterpart. This is realistic as many insurers engage with only few counterparties and they typically choose few types of highly standardised contracts. The *no netting* configuration, on the other hand, represents an insurer, which has a range of portfolios with several counterparties and, therefore, margins cannot offset. While this is somewhat less realistic assumption from the perspective of the number of counterparties, this configuration could be relevant in case of intra-day or overnight variation margin calls, when the timing of a margin payment and margin reception may differ. In our analysis, we present results as a range between these two extreme configurations.

We employ cash, bond and money market fund shares holdings to define the available liquidity (see Table A2.2). Cash is the preferred asset to cover variation margin calls, primarily because it can be transferred between counterparts very quickly. One approach is to consider the entire cash available. Another is to consider only a part of the cash available. This second case is intended to cover the situations when other instruments – not included in our analysis – would also generate margin calls. For instance, interest rate shocks tend to be accompanied by FX shocks, which may generate additional margin calls on FX derivatives, the second most prominent derivative class in insurers' portfolios. Highly liquid bonds can be accepted to cover variation margin calls under a wide range of bilateral agreements, even though they may be less preferred than cash by the receiving counterpart. Furthermore, insurers can use such bonds as collateral in repurchase agreement transactions (REPOs) or they may liquidate them to obtain cash to cover margin

69 For more detail on the clearing configurations for EEA insurers see the forthcoming ESRB publications.

calls (see cash and bond positions). Finally, insurers tend to invest in other highly liquid instruments such as money market funds, which can be quickly redeemed. Therefore, our broadest definition of liquidity considers also these instruments (last column in the table). Also, equity is very often a liquid asset, but we do not consider it in our analysis as it is generally not used as a collateral in derivatives transactions.

Table A2.2: Liquid assets

	Cash positions		Cash and bonds positions			
	narrow cash	**broad cash**	**cash & AAA bonds**	**cash & AAA/ AA bonds**	Cash, gov. bonds and MMF shares position	Cash, gov. and corp. bonds and MMF shares position
Instrument						
Cash and cash equivalents	Rescaled	X	X	X	X	X
AAA-rated gov. bonds			X	X	X	X
AA-rated gov. bonds				X	X	X
Money market funds (MMF) shares					X	X
AAA-AA corporate bonds						X
median [€ mln]	35	106	347	668	946	1,489
average [€ mln]	124	297	1,148	3,541	4,357	5,925
total [€ mln]	21,084	50,469	195,226	601,979	740,634	1,007,222

Source: Solvency II QRT
Reference date: Q4 2018
Notes: Every column indicates the instruments included in the liquidity position of the corresponding test. Cash and equivalents refers to the sum of two categories, namely coin and notes (CIC71) and cash equivalents and transferable deposits (CIC72). In first narrow cash position, we rescale the amount from Cash to the share of IRS in the derivatives portfolio following BoE FSR. For government and corporate bonds with rating AAA (CQS0) and AA (CQS1) we exclude encumbered securities and in the case of 100bps and 75 bps increases we apply a haircut of 10% and 7%, respectively, assuming portfolios have weighted average duration of approximately 10 years. Money market funds shares are estimated from the list of collective investments (CIC43). A tick (x) indicates that the instrument has included in the position.

RESULTS

In this section, we present our results on the impact of margin calls on insurers' liquidity. We show several estimates that take into account the different assumptions we presented in the previous section regarding netting, definitions of liquidity and interest rate shifts. Once we estimate the margin call for each company, we check when the margin exceeds the available liquidity. Further, we calculate the shortfall as the amount of margin not covered. On aggregate, this measure helps quantifying potential spillovers to the rest of the financial system. Finally, we elaborate on the key characteristics of the companies with liquidity shortfall.

3.1. SECTOR WIDE RESULTS

Overall, we observe shortage of liquidity, regardless of the amplitude of the interest shift and the definition of liquidity. In Table 3, we show the number of companies which are short of liquidity in all specifications of the exercise from the most severe situations (upper left corner: large shift and narrow definition of liquidity) to the less severe ones (low-

er right corner: small shift and wider definition of liquidity). The netting configuration plays a substantial role: in case of no netting the number of cases of liquidity shortage increases by 30% on average across specifications.

It is particularly relevant to consider the results for cash in combination with the small interest rate shift. We have seen such rate movements in one day happening in the past and should they repeat, cash is likely to be the only instrument to cover the overnight margin calls.

More specifically, we find that cash is not sufficient to cover margin calls for 10% to 14% of insurers using IRS, even in the scenario of 25bps shift and the broad definition of cash. These percentages reach up to 18% to 31% in the 100bps increase scenario, and triples on average in all scenarios when considering the narrow cash.

Most insurers can, however, cover their variation margin calls using highly liquid bonds or MMF shares. In the case of 25 bps shift the AAA-rated government bond holdings together with, only 4-2% of the undertakings cannot cover their margin calls. This figure declines to 1-0% when also AA-rated corporate bonds (MMF shares) are included in the available liquidity. When interpreting these figures it is important to bear in mind that using securities like high-rated bonds or MMF shares to cover variation margin calls is not always a viable solution. For example, one of the fastest ways of how insurers could get cash to cover variation margin calls is to use the repo market, where they could swap securities for cash. However, we found that only 21 insurers in our sample are currently borrowing cash in the repo market and, therefore, it can be difficult for other companies to access the market on a short notice and particularly so, when markets are in distress. Nonetheless, in the case of *a prolonged market turmoil over several days* (e.g. increases of 75 and 100 bps in our set-up), insurers may have enough time to liquidate the bonds and MMF shares, or successfully perform a collateral upgrade.

Table A2.3: Percentage and number of insurers short of liquidity.

Upward parallel shift [bps]	Cash positions				Cash and bonds positions				Cash, bonds and MMF shares positions		Cash, gov and corporate bonds and MMF shares positions	
	Cash available for IRS		Cash		Cash and AAA bonds		Cash and AAA/ AA bonds					
	No net	*Net*	*No net*	*Net*	*No net*	*Net*	*No net*	*Net*	*No net*	*Net*	*No net*	*Net*
100	40%	30%	24%	18%	6%	4%	4%	3%	2%	1%	2%	1%
	68	51	40	31	11	7	6	5	3	2	3	2
75	35%	25%	22%	17%	5%	4%	2%	2%	2%	1%	1%	0%
	60	42	37	29	9	7	4	4	3	2	2	0
50	29%	21%	18%	15%	5%	4%	2%	2%	1%	1%	0%	0%
	50	36	31	26	9	7	4	4	2	2	0	0
25	24%	17%	14%	10%	4%	2%	2%	2%	1%	1%	0%	0%
	40	28	24	17	6	3	4	3	2	2	0	0

Source: Solvency II QRT, Authors' calculations
Reference date: Q4 2018

Considering all test set-ups, the estimated liquidity shortfalls implied by the variation margins calls range between EUR 1bn to almost EUR 90bn (see Table A2.4). These estimates are sizeable compared to the overall Solvency II value of plain vanilla interest rate swaps held by the companies in our analysis sample, which totalled EUR 22.5bn. By the same token, they are sizeable compared to the initial available liquidity of these companies (EUR 21bn – EUR 740bn depending of the definition of liquidity) and also to their average open positions in the repo market (EUR 50bn of cash borrowing and EUR 15bn of cash lending on average during 2018). On the other hand, the figures are small compared to the overall size of total investment of the companies in our sample, which stands at around EUR 4.8 trillion.

Table A2.4: Total liquidity shortfall (EUR billion)

Upward parallel shift [bps]	Variation Margin		Cash positions				Cash and bonds positions				Cash, bonds and MMF shares positions		Cash, gov and corporate bonds and MMF shares positions	
			Cash available for IRS		Cash		Cash and AAA bonds		Cash and AAA/AA bonds					
	No net	*Net*	*No net*	*Net*	*No net*	*Net*	*No net*	*Net*	*No net*	*Net*	*No net*	*Net*	*No net*	*Net*
100	98.4	53.7	86.9	45.3	78.4	39.4	45.9	22.3	23.2	19.8	20.8	18.6	4.8	2.6
75	75.6	41.3	64.6	33.2	57.2	28.6	32.5	15.4	15.9	13.9	14.5	13.0	0.5	0
50	51.7	28.2	41.4	20.8	35.7	17.9	18.3	8.0	9.0	7.7	7.8	7.1	0	0
25	26.4	14.5	18.1	9.3	15.1	8.0	5.3	1.9	2.2	1.7	1.6	1.2	0	0

Source: Solvency II QRT, Authors' calculations
Reference date: Q4 2018

To narrow down this range, we focus on the increase of 25bps in combination with cash positions (and no netting), which results in a cash shortfall of EUR 15 bn. This is a large shortfall compared to the initial cash position of the companies which fall short of liquidity (EUR 5 bn, i.e. 300% of it) and also to cash positions of all companies in our analysis sample (EUR 50 bn).[70] In addition, the cash shortfall represents 1.7% of total investment of the companies experiencing capital shortfall. Since other means of transforming assets into cash such as an outright sale of securities may take several days, these companies would not be able to meet variation margin calls in cash already under the 25bps shift scenario and could become a potential source of risk in the system, with negative repercussions to their counterparties, typically banks.

Looking at larger interest rate shifts, the cash shortfalls increase significantly. This can be interpreted as the potential demand for cash by insurance companies, which spread across different markets. For instance, the shift of 75bps and 100bps under the netting assumption implies cash shortfalls in the range of EUR 28bn to EUR 45bn. Since such sizeable shifts are more likely to occur over a number of days rather than in one day, insurers may obtain cash through several channels, besides the repo market. One way, for instance, would be an outright sale of bonds, which has typically a settlement time of

70 One limitation of our study in this respect is the assumption that variation margin calls would be paid out of the cash holdings available at hand, while the insurance companies could also receive significant cash flows from premium payments and investment portfolios (e.g. coupons on bonds). We however argue that the majority of these "scheduled" payments into the company is already pre-planned for cash outflows (e.g. reinvestments of coupons in newly bought bonds) and payments to policyholders.

two days[71]. Therefore, the cash shortfalls in this case could be interpreted as the potential demand for cash from insurance companies, spread across the repo, bond, MMFs and other markets.

Looking at the results with liquidity positions broader than cash only, the short-falls decline but remain non-negligible for larger IR shifts. Specifically, we estimate liquidity shortfall of around EUR 13-22bn under the assumption of 75bps and 100bps shifts and allowing for netting. These figures are comparable to the cash short-falls estimated under the smaller shift of 25bps. However, larger shifts may occur in a time span longer than one day. Therefore, the negative spillovers to other counterparties from this type of liquidity shortfall – ceteris paribus – could be more limited.

Considering other types of securities in the liquidity positions further decreases short-falls in all scenarios. For example, adding also MMF shares and AAA-AA corporate bonds to the liquidity positions, shortfalls reduce to zero in the case of the 25 bps increase; but in the 100 bps increase scenario still 3 and 2 undertakings, respectively in the no netting and netting case, fall short of liquidity. Corporate bonds add a lot to the liquidity positions, but not enough to offset the variation margin required considering the initial large exposure towards IRS.

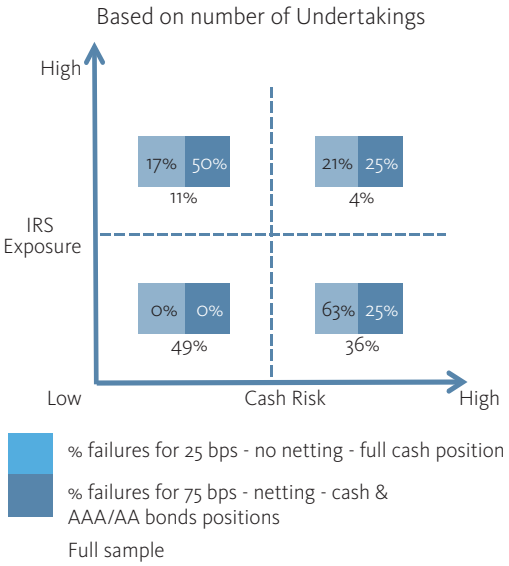
KEY CHARACTERISTICS OF THE COMPANIES FACING LIQUIDITY SHORT-FALL

Considering the results of 25bps shift in combination with the broad cash position, most liquidity shortages are due to small cash positions rather than high IRS exposure. To obtain this insight, we split companies facing liquidity short-falls in four groups based on the combination of the relative size of the IRS exposure and cash positions (labelling those with low cash as companies with high cash risk) and report their concentration in each of these groups in the light blue boxes in Figure A2.2. The results reveal that more than 80% (i.e. 21%+63%) of companies facing a liquidity shortage under this scenario are characterised by high cash risk rather than high IRS exposure, which is twice as higher frequency than in the full sample (40% = 36% + 4%)

On the other hand, three out of the four companies facing liquidity short-fall under the 75bps shift and broad liquidity definition (cash and bonds) have a relatively high IRS exposure (see dark blue boxes in Figure A2.2). This suggests that in a prolonged period of market distress associated with a more significant rate increase, the size of interest rate exposures rather than the liquidity position of a company is the main problem. In both cases, looking at the investments, the overall picture does not change.

71 Settlement can be faster under bilateral agreements, paying higher fees to the settlement bank.

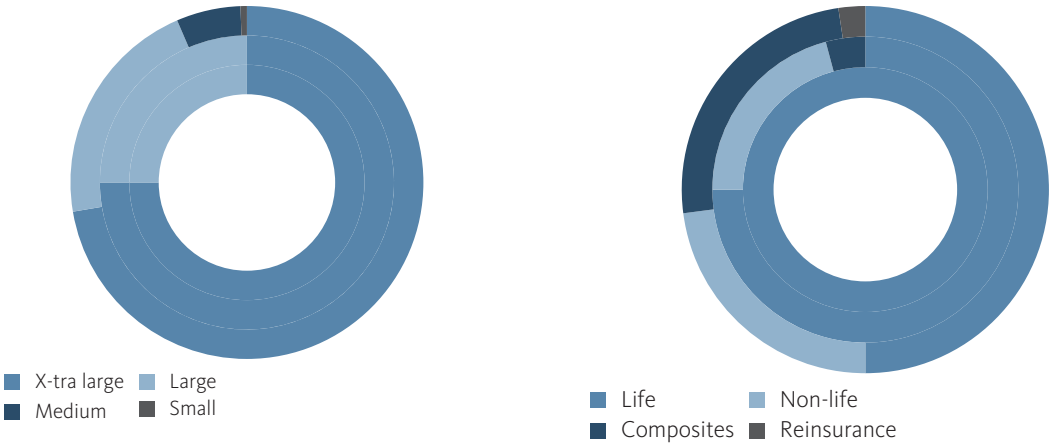
Figure A2.2: Characteristics of the companies facing liquidity short-fall: low liquidity positions or high IRS exposure?



Source: Solvency II QRT, Authors' calculations
Reference date: Q4 2018
Notes: Companies with high (low) "cash risk" are those with less (more) than 1% of cash out of total investments. Companies with high (low) IRS exposure are those for which the IRS notional amount over total investment is higher (lower) than 50%.

Companies facing liquidity short-fall are either large (25%) or very large (75%), (inner circles in Figure A2.3). These companies are also over-represented in the original sample with similar proportions. We do not observe liquidity shortages among medium size companies which represent 6% of the full sample. Figure A2.3 also shows that most of them are life companies, 75% in the 25bps scenario (middle circle) and 100% in the 75 bps scenario, even though life insurers represent 50% of the full sample. The percentage of non-life companies facing short-falls with 25 bps increase mirrors that in the full sample (around 21%), while a very low percentage (4% form 26% in the full sample) are composites.

Figure A2.3: Characteristics of the companies facing liquidity short-fall: size and type of business



Source: Solvency II QRT, Authors' calculations
Reference date: Q4 2018
Notes: Outer circle: full sample, middle circle: less severe scenario (25 bps up, cash, no netting), Inner circle: prolonged market turmoil (75 bps up, cash and AAA/AA bond, netting).

As a final remark, we note that country concentration of companies facing liquidity short-fall may pose financial stability concerns. Twenty-two (out of twenty-four) undertakings facing liquidity short-fall in the 25bps shift scenario are concentrated in a limited number of countries. We find that the total investment of the companies facing liquidity short-fall amounts to EUR 888bn, which is 35% of EUR 2,546bn, i.e. the total investment of all the insurers in those countries. For the individual countries, this figure ranges between 6% and 64%.

CONCLUSIONS

(Re)insurers have long term liabilities with typically stable liquidity needs. Therefore, (re) insurers can act as shock absorbers under normal market conditions. Margin requirements however introduce a change in the short term behaviour of (re)insurers which can impact the functioning of financial markets, by for example reducing the shock-absorption capacity of (re)insurers' portfolios in a crisis.

Margining practices for (re)insurer's derivative portfolios may have second-round effects on financial stability, via the following channels:

a) Repo markets. To cover the margin calls, some (re)insurers may have to rely on funding through repo markets. Banks' ability or willingness to provide liquidity via repos can be limited, for instance around year end or in stressed market conditions.
b) Fire sales. The need to meet variation margin calls quickly could lead (re)insurers to liquidate assets. Depending on market conditions, this could in turn affect other investors by moving prices and hence form a feedback loop reinforcing the price fall.
c) Money market funds (MMFs). If (re)insurers collectively withdraw their investments from MMF to cover margin calls, they could liquidity knock-on effect on other sectors.

Considering future research, the analysis could be further extended in a number of ways. Firstly, other derivatives classes, in particular FX, could be also considered. Next, netting between the VM payable and receivable could be considered per counterparty. Finally, it would be worthwhile to repeat the exercise at a later stage e.g. when a significant share of the grandfathered legacy transactions have also become subject to the margining requirements.

Our results suggest that there may be a potential liquidity risk stemming from the use of derivatives and in particular IRS activities by (re)insurers. The risk is driven by two factors: i) high IRS exposure and ii) high cash risk (i.e. insufficient holdings of cash and liquid assets). About 10% of all (re)insurers in the EU use IRS; typically large insurers and life insurers. The analysis concludes that some insurers have not yet adapted their asset allocation to the (new) requirements coming from the use of derivatives and the margining practices, which have been phased in recently.

The results can be used to inform policy makers. This will become particularly relevant in the near future – once the margining requirements become fully applicable to the entire portfolio of insurers derivatives transactions[72].

72 The margining requirements only apply to new trades concluded after the applicable phasing in deadlines. It will therefore take time before new trades replace all the legacy trades which are not covered by the requirements.

REFERENCES

Abad, J. et al. (2016), Shedding light on dark markets: First insights from the new EU-wide OTC derivatives dataset, ESRB Occasional Paper No 11/ September 2016, available at https://www.esrb.europa.eu/pub/pdf/occasional/20160922_occasional_paper_11.en.pdf.

Berends, K. et al (2013), The sensitivity of life insurance firms to interest rate changes, Economic Perspectives, Vol. 37, 2nd, 2013, Federal reserve of Chicago, available at https://www.chicagofed.org/publications/economic-perspectives/2013/2q-berends-mcmenamin-plestis-rosen.

Berends, K. and T. B. King (2015), Derivatives and collateral at U.S. life insurers, Economic Perspectives, Vol. 39, 1st, 2015, Federal reserve of Chicago, available at https://www.chicagofed.org/publications/economic-perspectives/2015/1q-berends-king.

BIS (2018), Financial stability implications of a prolonged period of low interest rates, Committee on Global Financial System, CGFS Papers No 61, available at https://www.bis.org/publ/cgfs61.htm.

Jensen, J. R. and S. D. Achord (2019), Pension companies will have large liquidity needs if interest rates rise, Analysis 19 November 2019 – No. 23m Danmarks Nationalbank, available at http://www.nationalbanken.dk/en/publications/Pages/2019/11/Pension-companies-will-have-large-liquidity-needs-if-interest-rates-rise.aspx.

EIOPA – Financial Stability Report - June 2018; https://eiopa.europa.eu/Publications/Reports/Financial_Stability_Report_Spring2018.pdf

EIOPA - Guidelines on system of governance (EIOPA BoS-14/253 EN); https://eiopa.europa.eu/GuidelinesSII/EIOPA_Guidelines_on_System_of_Governance_EN.pdf

ESRB (2019), Report on margins and haircuts (forthcoming)

ESRB OP xx/2019, Impact of margining practices on insurers´ liquidity (forthcoming)

ESRB WP 54/2017; Networks of counterparties in the centrally cleared EU-wide interest rate derivatives market; https://www.esrb.europa.eu/pub/pdf/wp/esrb.wp54.en.pdf?52afac2c22258efce835a6d07e19d606

ESRB WP 62/2017; The demand for central clearing: to clear or not to clear, that is the question; https://www.esrb.europa.eu/pub/pdf/wp/esrb.wp62.en.pdf?38f89ae77c322088e31601b862b6cb42.

FitchRatings (2918), Derivatives Central to Life Insurers' Risk Management, Special Report, April 2018.

Fache Rousova, L. and M. Guzio (2019), Insurers' investment strategies: pro- or countercyclical?, ECB Working Paper No 2299 / July 2019, available at https://www.ecb.europa.eu/pub/pdf/scpwps/ecb.wp2299~1d060f6979.en.pdf.

Fache Rousova, L. and E. Letizia (2019), Insurers' use of derivatives: Too low?, ECB Working Paper (forthcoming)

International Financial Law Review (2015), Derivatives after the crash, available at https://www.iflr.com/Article/3437700/Derivatives-after-the-crash.html?ArticleId=3437700

McDonald R. and A. Paulson (2015), AIG in Hindsight, Journal of Economic Perspectives, Volume 29, Number 2, Spring 2015, pp 81–106.