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Developing macroprudential policy for alternative investment funds

Towards a framework for macroprudential leverage limits in Europe: an application for the Netherlands

**Joint European Central Bank–
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Contents

Abstract

This joint ECB-DNB Occasional Paper aims to inform the ongoing discussions about an EU-level framework for operationalising macroprudential leverage limits for alternative investment funds (AIFs). It builds on, and extends, the analysis of an ECB-DNB special feature article published in the ECB's Financial Stability Review in November 2016. First, this Occasional Paper presents new EU-level evidence suggesting that leveraged funds exhibit stronger sensitivity of investor outflows to bad past performance than unleveraged funds, which has the potential to exacerbate systemic risk. Second, it devises a framework for assessing financial stability risks from leverage in investment funds. This is applied to leveraged AIFs managed by asset managers in the Netherlands using Alternative Investment Fund Managers Directive (AIFMD) data for the two-year period from the first quarter of 2015 to the fourth quarter of 2016. Third, it discusses the potential effectiveness and efficiency of various designs for macroprudential leverage limits. To this end, it builds on the findings for the Dutch AIF sector and suggests design options for further exploration at EU level. Beyond assessing financial stability risks from leverage in the Dutch AIF sector, the case study aims to show how equivalent information on AIFs at the European level – which will be made available to the European Securities Markets Authority (ESMA) and the European Systemic Risk Board (ESRB) in the coming years – could be used when developing an EU-level framework for operationalising macroprudential leverage limits.

Keywords: asset managers, alternative investment funds, leverage, macroprudential policy, financial stability

JEL codes: G23, G28, E61

Non-technical summary

Since the 2007-09 global financial crisis, the investment fund sector has expanded rapidly both on account of net inflows and rising asset valuations. In an environment of low yields, there is evidence that investment funds have engaged in increased risk-taking. In particular, there are concerns regarding liquidity risk and leverage, and discussions are ongoing at the European and global level to strengthen regulation.

Within the EU, competent authorities already have legal powers to impose macroprudential leverage limits on AIFs, such as hedge funds, bond funds and funds-of-funds. The European Systemic Risk Board (ESRB) has marked the operationalisation of this existing policy tool as a key part of the agenda to develop macroprudential policy beyond banking. Achieving this goal requires an EU-level framework for assessing financial stability risks related to leverage in the investment fund sector and evaluating potential designs for macroprudential leverage limits.

The risk of broad-based redemptions from investment funds resulting in fire sales, negative spillovers to financial institutions and/or a sudden reduction in debt financing, is central to the idea of the investment fund sector amplifying systemic risk. New findings for a large sample of European AIFs indicate that open-ended leveraged funds experience greater investor outflows after bad performance than unleveraged funds. This can be explained by investors' expecting proportionally larger valuation losses when remaining invested in leveraged funds. During stressed periods, leveraged funds need to de-lever proportionally more than unleveraged funds in order to obtain liquidity to cover margin calls and higher haircuts on leveraged positions. Also, leveraged funds have to sell relatively more assets following redemption requests to keep the leverage ratio constant. To the extent these asset sales impact market prices or are sold at fire sale prices, the net asset value of the portfolio declines.

These new findings on the greater sensitivity of leveraged funds to outflows support the idea that short redemption terms for more leveraged funds are undesirable from a macroprudential perspective. In addition, the findings complement existing evidence on the greater sensitivity of investor outflows to bad performance in illiquid versus liquid funds, which can be explained by higher liquidation costs for less liquid assets. Combining both insights, macroprudential policy should particularly target liquidity risks in leveraged funds. Beyond operationalising the existing macroprudential leverage tool, policymakers should therefore also look into developing the toolkit for macroprudential liquidity instruments.

Building on the AIFMD reporting framework, this study devises a framework for assessing financial stability risks from leverage in investment funds and applies it to leveraged AIFs in the Netherlands. The framework includes 20 indicators that measure fund size and leverage in different fund types and also aims to capture various channels through which systemic risk may materialise. Leverage reported under the AIFMD includes both financial leverage via direct borrowings and securities financing transactions, and leverage created through the use of

derivatives. Leverage that increases the exposure of funds, instead of reducing risks, is central to the financial stability assessment.

A case study shows that in 2016 Dutch leveraged AIFs had a total net exposure of €97.5 billion and a net asset value of €30.1 billion, representing about 8% of the AIF sector. However, only hedge funds and some overlay funds that manage interest rate risk for pension funds use substantial leverage – defined under the AIFMD as net exposure exceeding three times a fund's net asset value. Importantly, leverage in hedge funds is shown to be highly volatile, which is indicative of the ease with which funds can adjust net exposures via derivatives and reveals their ability to amplify market shocks if adjustments are procyclical. More generally, redemption restrictions appear not to be strictly aligned with the use of leverage in all cases, as some leveraged bond funds, funds-of-funds and equity funds offer daily redemptions.

At the same time, there are mitigating factors that may limit the potential for Dutch leveraged AIFs to contribute to systemic risk. First, contrary to unleveraged bond funds, there is little evidence of structural liquidity mismatches in the leveraged AIFs. Also, insurers and pension funds have strong ownership and investor linkages with the leveraged AIFs. This creates a channel for spillovers but may also reduce the potential for investor runs as these investors tend to have long investment horizons. Finally, the risk of Dutch leveraged bond funds contributing to a boom-bust cycle in debt financing is limited given the marginal corporate bonds investments in their aggregate investment portfolio, especially compared with unleveraged bond funds.

In order to avoid regulatory arbitrage, a high level of international coordination is needed when designing macroprudential policies such as leverage limits. As a first step, this study develops a framework to analyse the potential effectiveness and efficiency of various design options for leverage limits. Motivated also by findings for Dutch leveraged AIFs, the analysis suggests that as an initial step, constant leverage limits targeted at economic leverage and the redemption and/or liquidity profile of funds should be explored at EU level. Such macroprudential leverage limits would allow authorities to target those funds which are most likely to contribute to systemic risk. Moreover, with only a small number of strictly defined fund profiles, the calibration of such leverage limits would be relatively straightforward and would limit gaming and arbitrage opportunities. Time-varying aspects would warrant additional analyses and should be explored in the medium to longer term.

Guidance from ESMA – in close cooperation with the ESRB – on the frameworks needed for the operationalisation of macroprudential leverage limits would support a harmonised approach within the EU. Analyses using ESMA's EU-level database, which aggregates the nationally reported AIFMD data, would be beneficial in the development of such guidance. In particular, an analysis of EU-level data is required to eventually move towards defining quantitative thresholds for the implementation and calibration of macroprudential leverage limits. Notably, the forthcoming AIFMD review provides an opportunity to resolve any issues that may hinder the future implementation of leverage limits. For example, one important improvement would be to extend the AIFMD reporting framework with details on the underlying calculation of reported leverage figures – similar to the level of information available to banking supervisors in the context of the leverage ratio for banks.

1 Introduction: operationalising an existing macroprudential tool

Since the global financial crisis, the investment fund sector has expanded rapidly both on account of net inflows and rising asset valuations. Between 2008 and the end of 2016 total net assets of European investment funds more than doubled from €6.1 trillion to €14.1 trillion (see Chart 1).[1] Notably, in the same period, the size of European AIFs more than tripled from €1.6 trillion to €5.5 trillion. AIFs currently account for 39% of the European investment fund sector and include various types of funds, such as hedge funds, bond funds, (private) equity funds, real estate funds, funds-of-funds, mixed funds and money market funds. While the expansion of the asset management industry provides a welcome source of finance alongside bank credit intermediation, it may also be accompanied by new risks to financial stability.

In the current environment of low yields, there is evidence that the investment fund sector has engaged in increased risk-taking. Investment funds in the euro area have on average shifted their holdings from higher to lower-rated debt securities against the background of falling yields (see Chart 2). Investment funds have also increased average maturities in their portfolios and decreased the share of liquid assets. Leverage is more difficult to monitor, as it can be created not only through outright borrowings, but also through derivatives which are not fully reflected in the available balance sheet metrics.[2] Risk-taking in search of higher-yielding assets is likely to continue in a low interest rate environment. However, if interest rates were to suddenly rise, investment funds could face large and mounting outflows resulting in selling pressures.

Given that policymakers are concerned in particular about liquidity risk and leverage in this sector, discussions are ongoing at the international level to further strengthen regulation for the investment fund sector. Central banks and supervisors remain vigilant about potential financial stability risks stemming from the asset management industry.[3] Addressing these concerns, the Financial Stability Board (FSB) recently published its final policy recommendations, which aim to mitigate structural vulnerabilities from asset management activities.[4] The FSB recommends that authorities monitor, inter alia, the use of leverage by investment funds and take action when funds pose significant leverage-related risks to the

1 European Fund and Asset Management Association (2017).

2 See also Doyle et al. (2016).

3 For example, see European Systemic Risk Board (2017a); Financial Stability Board (2017); European Central Bank (2016); Financial Stability Oversight Council (2016); Bank of England (2015); European Securities and Markets Authority (2015); International Monetary Fund (2015), and speeches by Vítor Constâncio (2016) and Steven Maijoor (2015). Notably, the acting Director and Chief Economist at the US Securities Exchange Commission, Scott W. Bauguess, in a recent speech (June 2017) stated "I'm confident saying now, that leverage, and the use of derivatives that create synthetic leverage, will exacerbate the next significant financial market disruption, if it isn't the cause of it".

4 Financial Stability Board (2017).

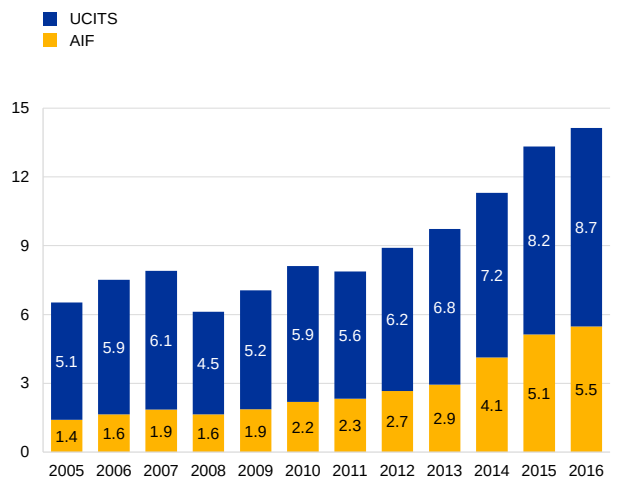
financial system. The FSB recommendations also address liquidity mismatches, as well as risks related to securities lending activities and operational risk.

Chart 1

The European investment fund sector has expanded rapidly since the global crisis

Total net assets of European investment funds

(2005-16, in EUR trillions)



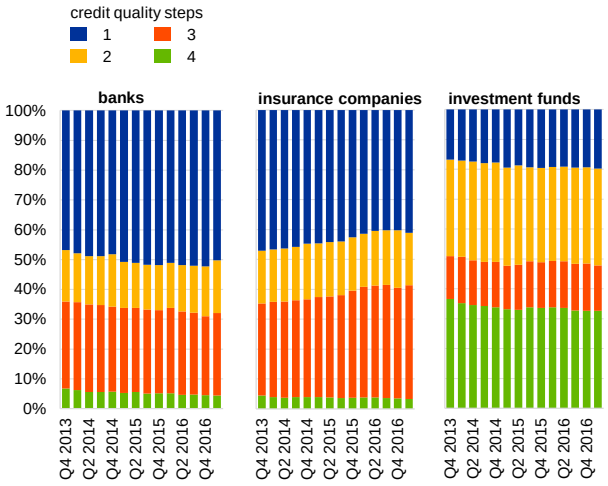
Source: European Fund and Asset Management Association.

Chart 2

Risk-taking in the euro area investment fund sector has been ongoing for some years

Euro area financial institutions' holdings of debt securities, broken down by rating and sector

(Q4 2013-Q4 2016; percentages of total assets)



Sources: ECB Securities Holdings Statistics by Sector and ECB calculations.
Notes: The legend denotes credit quality steps defined in accordance with the Eurosystem credit assessment framework (ECAF). The first category includes securities rated from AAA to AA-, the second from A+ to A- and the third from BBB+ to BBB-. A fourth category is added which includes all rated securities with a rating below credit quality step three. The analysis is based on the nominal amounts of euro and foreign currency-denominated securities, including "alive" and "non-alive" securities. The investment fund sector excludes money market funds.

EU regulation already restricts the use of leverage by undertakings for collective investment in transferable securities (UCITS), but there is no regulatory leverage limit for AIFs under the AIFMD. UCITS are allowed to use financial leverage by borrowing up to 10% of their assets, provided that such borrowing is only temporary. As regards the use of synthetic leverage via derivative exposures, UCITS are allowed to create synthetic exposure – as calculated by the commitment approach – only up to an amount equal to their total net asset value (NAV). As a result, UCITS using both borrowing and derivatives can lever up to a maximum of 2.1 times their NAV. Since mid-2013, AIFs in Europe have been regulated under the AIFMD. Under the AIFMD, asset managers have the obligation to set internal limits on the use of leverage by the AIFs they manage and disclose to investors on a regular basis any changes to the maximum level of leverage they employ.[5] While this could have a disciplining effect on the actual use of leverage, there is no regulatory leverage limit under the AIFMD.

Competent authorities within the EU have legal powers to impose macroprudential leverage limits on alternative investment funds. The AIFMD allows competent authorities to impose limits on the level of leverage that asset

[5] AIFMD Articles 15(4) and 23(5).

managers employ in their AIFs, or other restrictions on the management of the AIF, in order to "limit the extent to which the use of leverage contributes to the build-up of systemic risk in the financial system or risks of disorderly markets".[6] So far, however, these provisions have not been used. Discussions are ongoing on how to operationalise a framework at EU level which supports a harmonised risk assessment and the use of leverage limits for macroprudential purposes. Developing such a framework forms a key part of the ESRB's agenda to develop macroprudential policy beyond banking.[7]

This joint ECB-DNB Occasional Paper aims to inform discussions about an EU framework to operationalise macroprudential leverage limits for AIFs. It builds on and extends the analysis of an ECB-DNB special feature article published in the ECB's Financial Stability Review of November 2016.[8] In particular, this Occasional Paper:

1. presents new evidence suggesting that leveraged funds exhibit stronger sensitivity of investor outflows to bad past performance than unleveraged funds, which has the potential to exacerbate systemic risk;

2. devises a framework for assessing financial stability risks from leverage in investment funds and applies it to leveraged alternative investment funds managed by asset managers in the Netherlands using AIFMD data for the two-year period from the first quarter of 2015 to the fourth quarter of 2016;

3. discusses the key elements necessary to design an effective EU-level framework for macroprudential leverage limits, building on the findings for the Dutch AIF sector.

The first part of the analysis uses a European-wide dataset with monthly information on AIFs for the period from 2006 to 2017 to examine leveraged AIFs' general vulnerability to investor outflows. The second part builds on the granular supervisory information available on AIFs managed by asset managers in the Netherlands (where the third-largest AIF population in Europe is domiciled) to devise an assessment framework.[9] Importantly, beyond assessing financial stability risks from leverage in the Dutch AIF sector, this case study on the Netherlands aims to show how the same information available on AIFs in Europe could be used for the development of an EU-level framework for operationalising macroprudential leverage limits for AIFs.

6 AIFMD article 25(3).

7 European Systemic Risk Board (2016).

8 van der Veer et al. (2016).

9 In net asset value terms, AIFs in Europe are domiciled in Germany (29%), France (18%), the Netherlands (14%), Luxembourg (11%), Ireland (9%), United Kingdom (8%) and other countries (13%).

2 Investment fund leverage and systemic risk

Excessive leverage in the financial system gives rise to systemic risk that may materialise via fire sales, direct negative spillovers to financial institutions and sudden reductions in debt financing. The use of leverage in the investment fund sector may also contribute to systemic risk, even at low levels when combined with other structural vulnerabilities such as policies allowing investor redemptions at short notice and liquidity mismatches. New findings on a large sample of European AIFs suggest that open-ended leveraged funds exhibit a stronger sensitivity of outflows to bad past performance than unleveraged funds. This greater vulnerability to potential investor runs further amplifies the sensitivity to asset price changes, which is inherent in leveraged investment funds.

2.1 Investment funds may use excessive leverage

The use of leverage may come with negative externalities that give rise to systemic risk in the financial system. Leverage in the financial system becomes excessive when it makes economies prone to costly financial crises. The build-up of leverage and the subsequent deleveraging by banks, and within financial markets more generally, is widely viewed as a cause of the 2007-09 global financial crisis and its severe economic impact.[10] Negative externalities related to leverage may materialise via: i) fire sales[11] to repay debts, investor redemptions or margin calls that result in asset price declines for other market participants; ii) direct spillovers to counterparties and financial networks; or iii) restrictions on bond financing and loans generating a credit crunch. Studies suggest that these systemic externalities have a large enough quantitative impact on welfare to justify macroprudential policies which pre-emptively restrict the use of leverage.[12]

Market participants can contribute to the build-up of excessive leverage if they do not internalise the costs that their actions impose on the financial system. Pressure of short-term competition, optimism about future asset prices and the favourable tax treatment of debt over equity can all encourage financial institutions to lever up and increase an institution's vulnerability to unplanned events such as fire sales. Also, since market participants can enter into certain derivative contracts at little cost, there is an incentive to increase leverage synthetically to multiply gains, at

10 For example, see Brunnermeier (2009). Schularick and Taylor (2012) show that even since the late 19th century costly crises have more often than not been the result of "credit booms gone bust".

11 A fire sale can be defined as a forced sale of an asset at a dislocated price. The asset sale is forced in the sense that the seller cannot pay creditors without selling assets. The price is dislocated because the highest potential bidders are typically involved in a similar activity to the seller and are therefore themselves indebted and cannot borrow more to buy the asset. See Shleifer and Vishny (2011).

12 For example, see Geanakoplos (2010); Bianchi (2011); Thurner, Farmer and Geanakoplos (2012); Aymanns and Farmer (2015); and Korinek and Simsek (2016).

the risk of magnifying losses.[13] And while evidence shows that a financial institution's contribution to systemic risk tends to increase with its use of leverage,[14] financial institutions typically do no internalise the costs of financial crises associated with system-wide excessive leverage.

Leverage in the investment fund sector may increase systemic risk even at low absolute levels when combined with other structural vulnerabilities. Investment funds, in particular alternative investment funds, can employ leverage via borrowings or derivatives to increase their economic exposure and expected returns. Importantly, not only the level of leverage, but also other fund features, such as a fund's redemption and liquidity profile, can make the use of leverage excessive. For example, the redeemable nature of shares in open-ended investment funds makes them structurally vulnerable to sudden redemptions which can affect the liquidity position of funds and trigger fire sales. The use of leverage amplifies such fire sales and their potential market impact. As a result, when combined with short-term redemptions and/or a liquidity mismatch, the use of leverage is more risky from a systemic perspective even if not considered excessive per se. Notably, the callable nature of open-ended fund shares makes fund equity different from bank equity and creates run risk even when funds are not leveraged. The ability of fund managers to use liquidity management tools mitigates some of the run risk, but this is not sufficient from a macroprudential perspective. Fund managers cannot fully oversee the systemic implications of asset sales or the use of liquidity management tools and cannot be expected to act in the interest of financial stability.

The use of leverage in the investment fund sector can create and/or amplify systemic risk through direct and indirect channels. If leveraged investment funds encounter financial distress, this could be transmitted to their counterparties – such as banks and brokers – who provide the means to build-up leverage. Leveraged funds can also spread risks to the global financial system through losses incurred by their investors or reductions in the funding of other financial intermediaries and businesses. Importantly, leveraged funds are more sensitive to changes in asset prices. Relatively small adverse movements in asset prices, margin calls and higher haircuts may force them to sell assets in order to obtain liquidity and to deleverage.[15] In turn, this may affect other market participants indirectly through declining asset prices and increased margin calls. As such, leverage may closely interact with liquidity risk. Moreover, investors may be more inclined to redeem leveraged funds that experience stress because these funds may be perceived to be riskier than unleveraged funds.[16]

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13 The European Market Infrastructure Regulation (EMIR) has, however, made entering into derivatives contracts more costly. EMIR mandates that certain types of derivatives are cleared via central counterparties, which means that market participants have to post more collateral in the form of initial margin and/or default fund contribution. Non-centrally cleared derivatives are also subject to stricter margin requirements.

14 Adrian and Brunnermeier (2016); Acharya et al. (2017).

15 Notably, Raddatz and Schmukler (2012) show that neither fund managers nor investors are contrarian, especially during crises and that their behaviour amplifies crises and transmits shocks.

16 Fecht and Wedow (2014) look at contagious runs in the German open-ended real estate fund market and show that investors particularly withdrew from (and stopped investing in) a fund if it had a high leverage ratio. A fund with a high leverage ratio has less leeway to raise additional debt and, thereby, attract sufficient liquidity to meet excessive withdrawals.

2.2 New evidence suggests procyclical behaviour of investors in leveraged funds

First-mover advantages are central to the idea of the investment fund sector creating or amplifying systemic risk. To accommodate abrupt and sizable redemptions, investment funds may be forced to adjust their portfolios by engaging in unprofitable trades, reducing future returns. Because most of these trades are conducted in the period after initial redemption, net asset value paid to redeeming investors does not reflect the actual adjustment costs which will need to be incurred by remaining investors instead. In other words, there will be an advantage for investors who decide to redeem first as the burden will be on the remaining investors. These first-mover advantages among investors may be amplified if investors' actions are influenced by the expectation that other investors will take the same action.

Herding behaviour can amplify shocks, potentially accelerating effects on market prices and adding to procyclicality. If a sufficiently large number of fund investors anticipate and respond to the redemption behaviour of other market participants, the potential to disrupt financial stability increases. The more investors follow a similar redemption pattern, the higher the cost of portfolio adjustments will be and the more pronounced the negative effect on net asset value will be, increasing the risk of downward spirals. Herding may also be seen among asset managers. Recent studies argue that because relative performance will be the key determinant of fund inflows, managers will have a strong aversion to underperformance. This can result in concerted buying and selling of assets, potentially amplifying stress in a market downturn.[17]

Empirical evidence suggests that investors' redemption decisions are largely procyclical depending on past fund returns. The positive correlation between net inflows and outflows and past performance, the "flow-performance nexus", is well documented in the empirical literature. For equity funds, the relationship between flows and past returns has often been described to be convex, suggesting that investors buy funds with the highest past return, but hold on longer to poorly performing funds.[18] Recent studies show that the sensitivity of investor flows to poor performance is stronger for funds which hold a higher share of less liquid assets.[19] A possible explanation for this finding is that less liquid assets are harder to sell and that investors anticipate the higher costs associated with portfolio adjustments following redemptions. In order to avoid these costs, investors in less liquid funds are likely to respond to poor performance by redeeming their shares earlier.

Likewise, new findings suggest that leveraged funds exhibit stronger sensitivity of investor flows to bad past performance than unleveraged funds. This Occasional Paper finds that investors in leveraged funds react more to past negative returns than investors in unleveraged funds. The analysis is based on a

17 Feroli, Kashyap, Schoenholtz, and Shin (2014).

18 Ippolito (1992), Sirri and Tufano (1998) and Guercio and Tkac (2002).

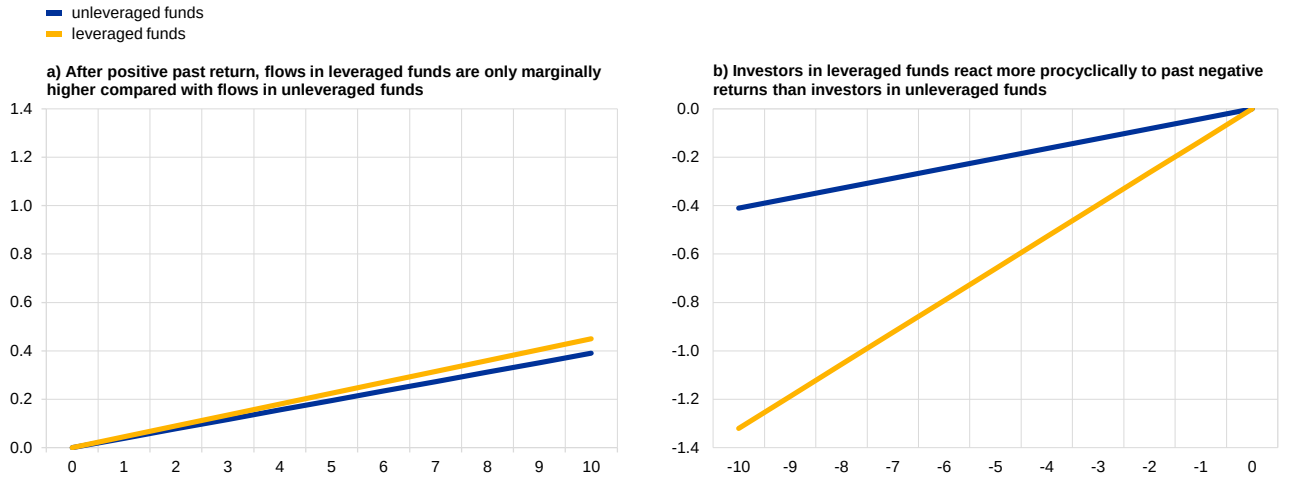
19 Chen, Goldstein, and Jiang (2010).

sample of 2,176 euro area AIFs for the time period from January 2006 to December 2017, on a monthly basis.[20] Illustrative results show that leveraged and non-leveraged AIFs have similar flow-to-performance sensitivities for periods of positive returns (see Chart 3a), whereas investor flows of leveraged funds are more sensitive following periods of negative performance (see Chart 3b). These results are derived from a multivariate regression model which tests the joint impact of leverage and returns on investor flows for AIFs (see Box 1). The empirical analysis suggests that the flow-performance sensitivity in leveraged funds is more than three times higher than in unleveraged funds after negative returns (see Box1, Table A). For leveraged funds a 10% decrease of fund performance would suggest average outflows of around 1.3% of a fund's total net assets in the next period (compared to outflows of only 0.4% for unleveraged funds).

Chart 3

Leveraged funds exhibit stronger sensitivity of outflows to bad past performance than unleveraged funds

(x-axis: lagged fund performance in percent, y-axis: net fund flows in percent of lagged total net assets)



Source: ECB calculation/estimation based on Lipper for Investment Management Database (Thomson Reuters).
Notes: The graphs shown are derived from a multivariate regression model analysing the sensitivity of fund flows to past fund returns between leveraged and unleveraged AIFs for the period from 31 January 2006 to 28 February 2017(see Box 1 for details). In the positive range, the reaction between investors in leveraged and unleveraged funds is relatively similar. A 10% increase in fund return is associated with an average inflow of 0.4% of total net assets in the following month (graph on the left). In the negative range, investors in leveraged funds react more procyclically to negative performance than investors in unleveraged funds. For leveraged funds, a 10% decrease in fund performance is associated with an average outflow of around 0.4%of a fund's total net assets in the next period. For leveraged funds, a 10% decrease of performance would imply average outflows of around 1.4%of lagged total net assets (graph on the right).

The use of leverage may increase procyclical behaviour among investors in leveraged funds, amplifying their response to bad performance and contributing to liquidity spirals. Investors may perceive leveraged funds to be more risky in particular during stressed periods, given that marginal net outflows and negative returns are expected to result in greater selling pressures and greater

[20] The following open-ended fund types are considered in the analysis: commodity funds, bond funds, alternatives, mixed assets, as well as hedge funds. Real estate funds are excluded from the sample, since Lipper does not identify any of the funds in the database as being financially leveraged. The data set captures funds from the following domiciles: Austria, Belgium, British Virgin Islands, Cayman Islands, Denmark, Finland, France, Germany, Guernsey, Hungary, Island, Ireland, Italy, Jersey, Liechtenstein, Luxembourg, Malta, the Netherlands, Norway, Spain, Sweden, and the United Kingdom. As at 28 February 2017 the total net asset value of funds amounts to approximately €545 billion, which captures about 10% of the European alternative investment fund sector; the Lipper sample is less representative for AIFs compared to UCITS in general. The sample is further compromised by missing data on either financial leverage or input parameters for synthetic leverage calculations.

associated future valuation losses for leveraged funds in comparison to unleveraged funds. To meet redemption requests, leveraged funds are expected to delever proportionally more than unleveraged funds in order to keep their leverage ratios constant. Adverse movements in asset prices, margin calls and higher haircuts may additionally affect leveraged funds more significantly, as they are more exposed to market changes and changes in asset prices, forcing these funds to sell higher volumes of assets to obtain liquidity and deleverage. In this sense, given the same value of net outflows, leveraged funds will have to sell a greater amount of assets and are thus expected to face higher associated future valuation losses than unleveraged funds. As a result, to avoid internalising the additional redemption costs in leveraged funds, investors in these funds are more likely to redeem shares after negative returns than investors in unleveraged funds.

Box 1
Empirical flow-performance model comparing leveraged and unleveraged funds

Multivariate regression model

To identify the sensitivity of investors to funds' performance, the empirical analysis makes use of variation in leverage across funds. Since redemptions impose higher costs on leveraged funds than unleveraged funds, investors in leveraged funds are more likely to redeem shares than investors in unleveraged funds. Therefore, in the analysis following the models by Chen, Goldstein and Jiang (2010) and Molestina, Wedow and Weistroffer (2017) we test for differences in flow-performance sensitivities/redemption patterns across leveraged and non-leveraged funds. To this end, a multivariate regression model of the following form is estimated:

$$Flow_{i,t} = \beta_0 Perf_{i,t-1} + \beta_1 Leverage_{i,t-1} * Perf_{i,t-1} + \beta_2 Leverage_{i,t-1} + \beta_3 X_{i,t-1} + \lambda_t + \omega_i + \epsilon_{i,t}$$

The estimation is conducted at the fund-month level, where $Perf_{i,t-1}$ is the lagged performance measure. Leverage is a binary variable capturing both synthetic and financial leverage: a value of one is assigned to funds that are either financially and/or synthetically leveraged; a value of zero is assigned to funds that do not use leverage. A more detailed derivation of the measure is provided below. Furthermore, X is a vector of control variables including lagged flows ($Flow_{i,t-1}$), the lagged size of the fund ($TNA_{i,t-1}$) measured as the log of the fund's total net assets, the lagged total expense ratio ($TER_{i,t-1}$), and the return volatility ($TRVola_{i,t-1}$) estimated for a past 12-month period. Monthly time-fixed effects (λ_t) as well as fund-fixed effects (ω_i) are included in the model.[21]

Data source

For our analysis we use fund-level data from the Lipper for Investment Management database (Thomson Reuters). The Lipper database contains granular information on funds and fund managers for the time period from January 2006 to December 2017 on a monthly basis. The analysis is based on a sample of 2,176 euro area AIFs including commodity funds, bond funds, alternatives, mixed assets as well as hedge funds.

[21] To address potential bias typically arising from the estimation of dynamic panel models, the flow performance relationship is also assessed using GMM. Our results remain qualitatively robust.

Estimating leverage

In our estimation we consider both the financial as well as the synthetic leverage of a fund. While information on financial leverage is available through the Lipper database, the database does not contain information on the synthetic leverage of a fund. Therefore, synthetic leverage is approximated, identifying synthetically leveraged funds based on the capital asset pricing model (CAPM) beta, as well as holdings of cash and derivatives.

Following Haquin and Mazzacurati (2016), funds with high CAPM betas and large cash holdings are likely to also be synthetically leveraged.[22] The rationale is that, for a given benchmark, a higher beta can be achieved by increasing leverage: higher betas pointing to a higher covariance between the fund's performance and that of the respective benchmark. Large cash holdings are also more likely to be observed for synthetically leveraged funds since these funds rely on higher cash holdings to maintain futures positions and other derivatives exposures, or as a buffer for changes in variation margins and margining requirements. We add a third criterion based on funds' actual holdings of derivatives and/or other financial instruments which may be used for leverage. More specifically, for the analysis funds must be in the upper 25th percentile of CAPM beta and cash holdings, and make use of derivatives for the fund to qualify as synthetically leveraged.

Table A

Regression results: dependence of funds' outflows to past returns and leverage

	Fund flows		
	Full sample	Negative returns	Positive returns
Return	0.040***	0.041***	0.039***
	(0.005)	(0.012)	(0.0108)
Leverage	-0.290	-0.364	-0.056
	(0.261)	(0.258)	(0.327)
Leverage*Return	0.035**	0.091***	0.006
	(0.015)	(0.034)	(0.033)
Covariates	Yes	Yes	Yes
Monthly fixed effects	Yes	Yes	Yes
Time fixed effects	Yes	Yes	Yes
N	150,760	64,621	86,139
Adj. R-sq.	0.058	0.044	0.055

Sources: Authors' calculations.
Notes: Standard errors in parentheses. The ***, ** and * stand for significant coefficients at the 1%, 5%, and 10% levels, respectively.

[22] While this is a strong assumption to make, it makes it possible to proxy the degree of synthetic leverage and thereby to provide a more holistic view on funds' leverage.

3 Assessing financial stability risks from leveraged alternative investment funds: an application for the Netherlands

This chapter presents a framework for assessing financial stability risks from investment funds and applies it to leveraged AIFs in the Netherlands. The use of substantial leverage appears to be limited to hedge funds and some particular bond funds which control interest rate risk for pension funds. Importantly, the large volatility of hedge fund leverage shows the ease with which funds can adjust net exposures via derivatives and reveals the potential of amplifying market shocks and contributing to procyclicality. More generally, the short redemption terms of some leveraged AIFs seem undesirable from a macroprudential view as the use of leverage increases the vulnerability of funds to investor runs (see Section 2.2) and amplifies the potential market impact of asset sales. At the same time, there are mitigating factors that may limit the potential for Dutch leveraged AIFs to contribute to systemic risk. First, there is little evidence of a structural liquidity mismatch within the leveraged AIFs. In addition, insurers and pension funds have strong ownership of and investor linkages with the leveraged AIFs, which may reduce the potential for investor runs. Finally, the risk of contributing to an excessive provision of debt financing and subsequent deleveraging is limited, given the marginal investments of leveraged AIFs in corporate bonds.

3.1 A framework and data for assessing financial stability risks from investment funds

Operationalising macroprudential leverage limits first requires a framework to assess the potential contribution of leveraged funds to systemic risk. Macroprudential leverage limits should limit the extent to which the use of leverage contributes to the build-up of systemic risk. As a first step, a framework is required for assessing financial stability risks from leverage in AIFs. Apart from information on the size and level of leveraged funds, and the different sources and usages of leverage, such a framework should aim to capture the channels through which systemic risk may materialise, such as fire sales, direct spillovers to other financial institutions and direct credit intermediation.[23]

Table 1 proposes a framework based on indicators that can be constructed from information reported by AIFs in Europe. With the introduction of the AIFMD in mid-2013, AIFMs report to national competent authorities up to 301 information items on each leveraged AIF they manage. In particular, AIFMs with more than

[23] Notably, while it is possible to separate these systemic risk channels in theory, they are intertwined and likely to be mutually reinforcing in reality.

€1 billion of assets under management have to report on all their leveraged funds, irrespective of the size, on a quarterly basis, while all other AIFMs are required to report on leveraged funds with assets under management exceeding €500 million on a quarterly basis. The assessment framework includes 20 indicators. The choice of indicators is guided by the dual aim of capturing the size of leveraged funds and the relevant potential systemic risk channels, while at the same time not creating an overly complex framework.

Table 1

A framework for assessing financial stability risks from investment funds: an application to leveraged alternative investment funds in the Netherlands

Relative risk (by fund type) of leveraged funds in contributing to a build-up of systemic risk

The colours for individual indicators indicate respectively a lower (green), medium (yellow) or higher (red) relative risk of contributing to a build-up of systemic risk and are based on a combination of the indicator value (average quarterly value in 2016) and judgement. The underlying indicator values are calculated at the aggregate fund type level (i.e. bond funds, hedge funds, funds-of-funds, equity funds and mixed funds) as the sum of the net asset value weighted contribution of individual funds.

Indicators		Leveraged					Section
		Hedge funds	Bond funds	Funds-of-funds	Equity funds	Mixed funds	
		1. Risk of market impact					
Size	1.1 Net exposure (EUR billion)						3.2
	1.2 Net asset value (EUR billion)						
		2. Risk of fire sales					
Leverage	2.1 Net financial and synthetic leverage (ratio of net exposure to NAV)						3.2
	2.2 Gross to net leverage						
Redemption policy	2.3 Redemption duration - minimum time in days investors have to wait to withdraw investments						3.3
Liquidity mismatch	2.4 Redemption duration minus perceived portfolio liquidity in days						3.4
	2.5 Ratio of net asset value to highly liquid assets						
	2.6 Share of illiquid assets (% NAV)						
Investor and counterparty concentration	2.7 Share of net asset value owned by five largest investors						3.5
	2.8 Total net credit exposure to top five counterparties (% NAV)						
		3. Risk of direct spillovers to financial institutions					
Linkages via ownership of asset manager	3.1 Banks as parent company of asset manager						3.5
	3.2 Insurers as parent company of asset manager						
	3.3 Pension funds as parent company of asset manager						
	3.4 Independent asset manager						
Linkages via investments	3.5 Investments in financial institutions (% NAV)						
	3.6 Investments in structured & securitised products (% NAV)						
Linkages via investor base	3.7 Banks in investor base (% NAV)						
	3.8 Insurers in investor base (% NAV)						
	3.9 Pension funds in investor base (% NAV)						
		4. Risk of interruption in direct credit intermediation					
Direct credit intermediation	4.1 Investments in corporate bonds (% NAV)						3.6

Sources: DNB and ECB.

The assessment framework is applied to leveraged AIFs managed in the Netherlands because information at EU-level is not yet available. The information on leveraged AIFs is collected by national competent authorities and is shared with ESMA, which aggregates the data at EU-level. We apply the framework to the Netherlands using quarterly data for the two-year period from the first quarter of 2015 up to the fourth quarter of 2016. The subsequent sections discuss the key findings of the risk assessment (see Table 1, final column). Beyond assessing financial stability risks from leverage in the Dutch AIF sector, this case study aims to show how the future EU-level information on AIFs could be used to develop an EU-level framework for assessing financial stability risks from AIFs.

The use of leverage by AIFs as reported under the AIFMD includes both financial and synthetic leverage. Investment funds can obtain financial leverage via direct borrowings and securities financing transactions and can obtain synthetic leverage using derivatives. The AIFMD reporting obligations require managers to take into account both ways of creating exposure when calculating their use of leverage, where derivatives need to be converted into cash-equivalent positions. The use of leverage is then reported as the ratio of a fund's exposure to its net asset value. As such, funds that do not use leverage report a leverage ratio equal to 1. Notably, and contrary to the empirical analysis in Section 2.2 which uses a proxy for the use of leverage by European AIFs, the sample selection of leveraged AIFs included in the assessment is based on the leverage figures as reported under the AIFMD.

A fund's reported "net" or "economic" use of financial and synthetic leverage is central to the financial stability assessment in this study. Asset managers have to report the leverage of an AIF as calculated by the "gross" and "commitment" method. The gross leverage ratio is based on the sum of all exposures, while the commitment leverage ratio allows funds to calculate exposure net of netting and hedging arrangements, where derivative instruments or security positions are concluded with the sole aim of eliminating risks (see Box 2 for further details). As such, the resulting "net" use of financial and synthetic leverage best represents a fund's "economic" leverage, i.e. the leverage that increases the fund's net exposure. Notably, the difference between a fund's gross and net use of leverage is included in the framework to indicate a fund's reliance on netting and hedging arrangements, which may not hold up under stressed circumstances.

Box 2
Provisions to calculate and report on leverage under the AIFMD

Delegated Regulation (EU) No 213/2013 includes specific provisions for asset managers to calculate the gross and net exposure of their AIFs.[24] Under the AIFMD, leverage is defined as the ratio between the exposure of an AIF and its net asset value. In turn, the Regulation includes specific provisions on how managers should calculate the gross and commitment (or net) exposure of an AIF. The gross exposure of an AIF is calculated as the sum of the absolute values of all

[24] Article 6 to 8 of Delegated Regulation (EU) No 213/2013.

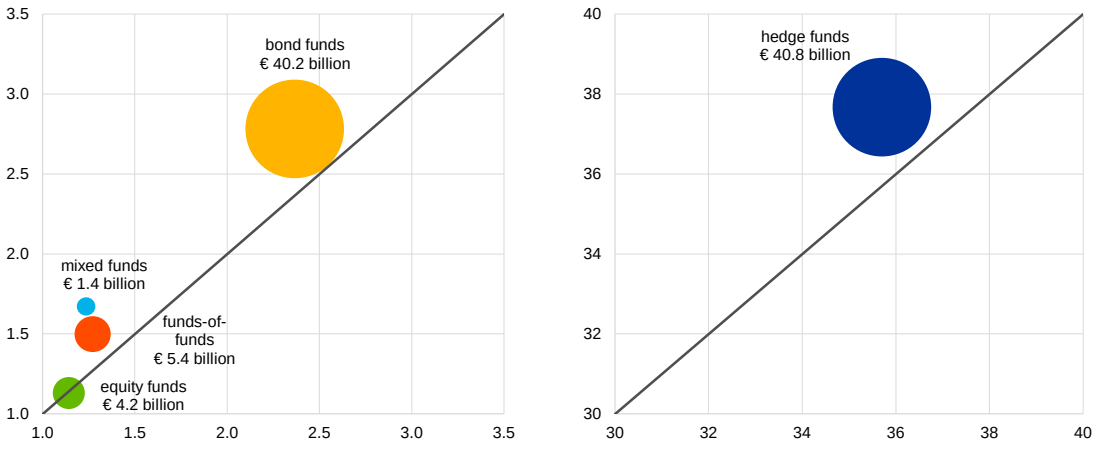
positions (excluding cash and cash equivalents), where derivative instruments are converted into the equivalent position in their underlying assets using defined conversion methodologies, and by including all exposures resulting from the reinvestment of cash borrowings and positions within repurchase or reverse repurchase agreements and securities lending or borrowing. As such, the gross method includes both exposures obtained by the use of financial leverage via direct borrowings and securities financing transactions, and synthetic leverage using derivatives. For the calculation of commitment exposure, managers need to apply netting and hedging arrangements where trades on derivative instruments or security positions are concluded, with the sole aim of eliminating the risks linked to positions taken through the other derivative instruments or security positions. A netting arrangement is a combination of trades on derivatives and/or security positions which refer to the same underlying asset, irrespective of the maturity,[25] whereas hedging arrangements do not necessarily refer to the same underlying asset.

Chart A

Alternative investment fund managers can use derivatives to eliminate the risks linked to positions taken

Gross leverage, net leverage and net exposures within Dutch leveraged alternative investment funds

(average quarterly values in 2016; bubble size: net exposure in EUR billions; x-axis: net exposure/net asset value; y-axis: gross exposure/net asset value)



Sources: DNB, and DNB and ECB calculations.

One advantage of the AIFMD leverage measures over rudimentary financial leverage measures is their ability to capture the most important source of AIF leverage: synthetic leverage. A rudimentary leverage measure, i.e. the ratio between the balance sheet value of assets and the net asset value of a fund, does not adequately capture synthetic leverage. The reason is that derivatives are only included on fund balance sheets at market values, which generally do not reflect the potential risks. Because AIFs also use derivatives to build up leverage, a rudimentary financial leverage ratio would significantly underestimate the use of leverage by funds. The AIFMD addresses this problem by requiring derivatives to be converted into equivalent positions.

Another advantage is the complementarity of the commitment and gross leverage measures, which inform authorities about economic risk-taking as well as dependence on netting and hedging. The commitment exposure measures the fund's economic risk-taking, which is of primary

[25] With the exception of interest rate derivatives for which duration netting rules apply as specified in Annex III of Delegated Regulation (EU) No 231/2013.

importance to authorities. Yet, there are some risks associated with netting and hedging which are not captured by the commitment exposure measure. In particular, counterparty defaults may cause netting and hedging sets to break down and leave the fund with large open positions and liquidity needs. Comparing the gross and commitment leverage gives authorities an indication of the relevance of these vulnerabilities. Chart A shows that, in absolute terms, netting and hedging are particularly relevant for hedge funds and bond funds.

A current drawback of the AIFMD leverage measures is their potential to overstate the risk exposure of certain derivatives, most notably interest rate derivatives. The AIFMD requires a conversion of derivative positions into equivalent positions in order to capture the synthetic leverage. These equivalent positions are largely dependent on the notional value of the derivatives contracts and therefore tend to overstate the risks. To address this concern with respect to the conversion of interest rate derivatives, managers of AIFs have to calculate a duration-weighted adjusted notional value of interest rate derivatives and also apply duration netting rules when calculating the exposure.[26] Due to a lack of detailed data on the underlying calculation of leverage, however, it is unclear whether this approach is sufficient to address the potential for overstating the risk exposure. This is especially true for funds that are heavily engaged in interest rate swaps, since only a small percentage of the notional amount is actually exchanged between counterparties.

The drawback of potential overestimation of derivatives exposure can be mitigated by improved insight into the use of leverage, netting and hedging. The upward bias in the leverage measures does not pose a problem for macroprudential authorities, as long as they are mindful of the implications the exposure methodologies have on the overall outcome. Improved insight into netting and hedging could help in this regard, for instance by requiring fund managers to provide a step-by-step breakdown of the derivation of commitment exposure from gross exposure.

In addition, the AIFMD leverage measures are expected to improve over time as a result of global initiatives to develop consistent measures for fund leverage. The International Organization of Securities Commissions has been tasked with developing consistent measures of leverage in funds to facilitate improved monitoring of leverage for financial stability purposes by the end of 2018.[27] Following the outcome of that assessment, the current AIFMD leverage measures may be further improved through the regular review process.

3.2 Use of substantial leverage limited to hedge funds and interest rate overlay funds

Leveraged AIFs managed by asset managers in the Netherlands had a total net asset value of €30.1 billion and net exposure of €97.5 billion in 2016. Although economically relevant in size, leveraged AIFs represent only about 8% of the total Dutch AIF sector in net asset value terms.[28] As such, the vast majority of Dutch AIFs

[26] AIFMD Annex III provides further details on the calculation.

[27] Recommendations 10 and 11 in Financial Stability Board (2017).

[28] The total net asset value of licensed AIFs in the Netherlands was €330 billion in the fourth quarter of 2016. Notably, a number of investment funds managed by pension funds are in the process of obtaining AIF licences.

do not use leverage. The analysis thus covers a relatively small part of the Dutch AIF sector but includes five different fund types: bond funds, hedge funds, funds-of-funds, equity funds and mixed funds. Notably, only two alternative real estate funds and one infrastructure fund use leverage. Moreover, two of these three funds have a closed-end structure which effectively eliminates the risk of an investor run – a key mechanism through which investment funds may be forced into fire sales and contribute to systemic risk. Given the macroprudential focus of this study, these funds are excluded from the analysis.

The use of leverage and the absolute size of exposures increase a fund sector's potential market impact in the event of a negative shock. The use of leverage makes funds more sensitive to investor outflows; i.e. given the same value of outflows leveraged funds will have to liquidate a greater amount of assets to keep the leverage ratio constant.[29] As such, leverage can contribute to procyclicality when funds reduce exposures during business cycle downturns or engage in automatic asset sales triggered by increases in market volatility. In turn, the potential market impact increases with the absolute size of exposure reduction.

Hedge funds and leveraged bond funds are most likely to amplify shocks given their use of leverage and relatively large net exposure. The level of leverage in the Dutch hedge fund sector was on average 36 times the sector's net asset value in 2016 (see Chart 4). While the total net asset value of Dutch hedge funds is relatively small with a value of €1.1 billion, due to their substantial use of leverage their total net exposure equals €40.8 billion. Leveraged bond funds had an almost equally large net exposure of €40.2 billion, or 2.4 times their net asset value of €17.0 billion. Notably, some bond funds use "substantial" leverage, which is defined under the AIFMD for reporting obligations as net exposure exceeding three times the fund's net asset value (see Chart 5). In turn, leveraged funds-of-funds, equity funds and mixed funds only use leverage in the order of 1.1 to 1.3 times their net asset value. Moreover, the size of leveraged funds-of-funds, equity funds and mixed funds is relatively small, with a total net exposure of €5.4 billion, €4.2 billion and €1.4 billion respectively.

[29] Teo, M. (2011).

Chart 4

Hedge funds and leveraged bond funds most likely to amplify shocks and impose externalities on the system

Leverage, gross and net exposure among Dutch leveraged alternative investment funds

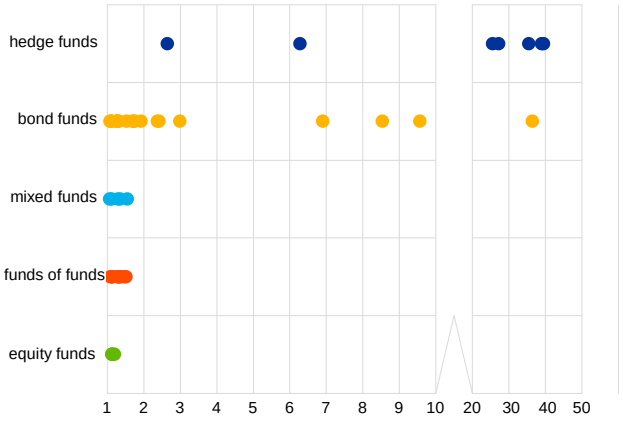
(average quarterly values in 2016; bubble size: net exposure in EUR billions; x-axis: net exposure/net ass34 (04 Tc -0.002 Twm)20 (16;)2j Tw1340 Tc 0 Tw 34.64 0 Td (/2j T6;)2j Twa 34.6 34.6; nt bi

Chart 5

Substantial use of leverage limited to hedge funds and some bond funds

Leverage among Dutch leveraged alternative bond and hedge funds

(average quarterly values in 2016; y-axis: net exposure/net asset value)



Sources: DNB, and DNB and ECB calculations.
Note: Substantial leverage is defined under the AIFMD as net exposure exceeding three times a fund's net asset value.

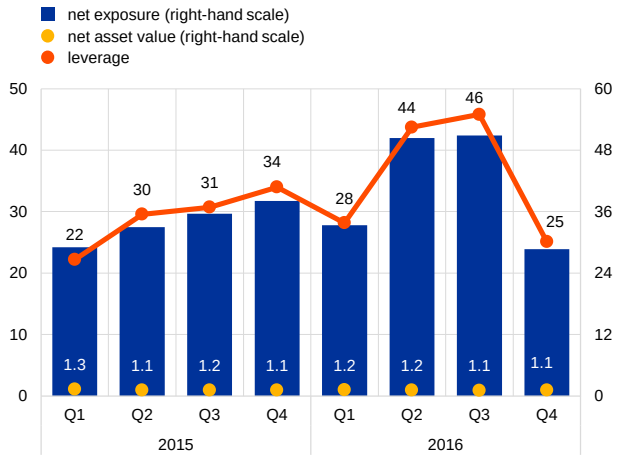
The frequency with which hedge funds adjust net exposures via derivatives reveals their ability to quickly respond to market movements, bearing the risk of amplifying market shocks if adjustments are made in a procyclical manner. The use of leverage in hedge funds appears to be highly volatile (see Chart 6). The quarterly pattern of leverage shows a large jump from a leverage level of 28 in the first quarter of 2016 to 44 in the second quarter of 2016. Subsequently, the use of leverage increased somewhat further – to 46 – in the third quarter of 2016 before declining sharply to a leverage level of 25 in the fourth quarter of 2016. Notably, these leverage figures represent the sum of individual hedge funds' net asset value-weighted use of leverage. The use of leverage by underlying individual funds even reached levels up to 74 times the net asset value. Importantly, the volatility in the use of leverage reflects large increases and decreases in net exposure (see the blue bars in Chart 6) via the use of derivatives, and is not driven by changes in the net asset value (the denominator in the leverage ratio). Indeed, net exposure increased by €17.1 billion in the second quarter of 2016 and decreased by €22.2 billion in the fourth quarter of 2016.

Chart 6

Hedge funds' use of leverage is highly volatile due to large changes in net exposures via derivatives

Leverage, net exposure and net asset value within the Dutch hedge fund sector

(y-axis: net exposure/net asset value (left-hand scale); net exposure in EUR billions (right-hand scale))



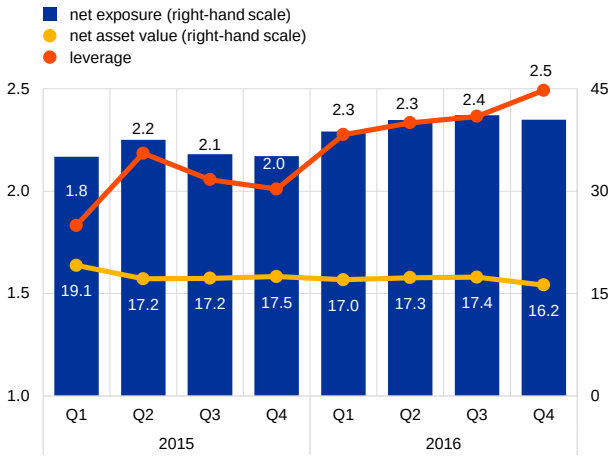
Sources: DNB, and DNB and ECB calculations.

Chart 7

On average, bond fund leverage has increased due to net exposure increases and lower net asset values

Leverage, net exposure and net asset value within the Dutch leveraged bond fund sector

(y-axis: net exposure/net asset value (left-hand scale); net exposure in EUR billions (right-hand scale))



Sources: DNB, and DNB and ECB calculations.

The majority of Dutch hedge funds are quantitative managed futures which invest in non-centrally cleared derivatives with only a few counterparties. Managed futures are a diverse subset of active hedge fund strategies that largely focus on financial futures markets – equity indices, fixed income and foreign exchange – with additional allocations to energy, metals and agricultural markets. The Dutch hedge funds that apply a managed futures strategy invest in non-centrally cleared derivatives with only a handful of counterparties, which exposes these funds to some degree of counterparty concentration risk that, in the event of a counterparty failure, could potentially trigger fire sales. Subsequently, they apply a quantitative trading process where there is no human intervention between the trade signal generation and the orders placed on the market. The remaining minority of Dutch hedge funds apply equity long-short or market neutral strategies.[30]

The use of leverage in leveraged bond funds increased from 1.8 in the first quarter of 2015 to 2.5 in the fourth quarter of 2016. On average, this increase was due to both a decrease in net asset value (denominator) and an increase in net exposure (numerator). Total net asset value decreased from €19.1 billion to €16.2 billion (see Chart 7). In the same period, the total net exposure increased from €35 billion to €40.5 billion. This average increase in net exposure, however, was only driven by a very small number of funds. The use of leverage by most of the underlying individual funds did increase, but this was due to relatively larger net asset value decreases in tandem with declining net exposures.

30 An equity long-short strategy is an investing strategy that involves taking long positions in stocks that are expected to increase in value and short positions in stocks that are expected to decrease in value. Market neutral strategies seek to exploit differences in stock prices by being long and short in stocks within the same sector, industry, market capitalisation, country, etc. This strategy creates a hedge against market factors.

The few substantially leveraged bond funds consist of overlay funds that manage interest rate risk for pension funds. A small number of bond funds use leverage exceeding three times their net asset value (see Chart 5). These substantially leveraged funds had a total net exposure of €20.5 billion – representing about half of the net exposure of leveraged bond funds – and are all overlay funds. Overlay funds seek to hedge the interest rate risk (i.e. rising obligations at a time of falling interest rates) of pension funds and insurers, and have large derivatives portfolios consisting primarily of interest swaps in combination with investments in EU bonds.[31] Institutional investors use overlay funds to increase/reduce the interest-rate sensitivity of their obligations without having to buy/sell government bonds for the relevant maturity. The advantage of this synthetic leverage is that it leaves the investors with more money to invest in other investments. The downside of this synthetic leverage, however, is that it makes the fund more volatile than ordinary bond funds.

3.3 Stricter alignment between redemption restrictions and the use of leverage is desirable

Contractual restrictions on the possibility for investors to redeem shares allow funds to mitigate the risk of sudden investor runs. Investment fund redemption policies cover the terms and conditions for investors to withdraw their investments. Two key ingredients of such policies are the notice period – the minimum time investors have to wait to redeem their shares after notifying the asset manager – and the redemption frequency, which specifies a fixed date at which investors can redeem shares (e.g. daily, monthly, quarterly). Moreover, funds may also have a lock-up period – a time window in which investors cannot redeem shares. By offering shares with constraints on investor withdrawals, asset managers can avoid liquidating positions when their trades temporarily go against them and prevent a fire sale. In addition to these normal contractual redemption policies, fund managers may have the ability to use additional liquidity management tools to mitigate outflows in exceptional circumstances; examples include suspension of redemption, redemption fees and gates. The ability of fund managers to use such tools, however, is not a sufficient mitigant from a macroprudential perspective. For reputational reasons fund managers may refrain from implementing such tools where necessary. Moreover, because of incomplete information and coordination problems fund managers are not able to oversee the financial stability implications of selling assets or applying liquidity management tools. In addition, they cannot be expected to act in accordance with a financial stability objective.

AIFMs have no explicit regulatory obligation to set stricter redemption terms for leveraged AIFs, but hedge funds generally have redemption restrictions. There are no strict requirements but AIFMs have to demonstrate to competent authorities that the use of leverage in the funds they manage is “reasonable”.[32] In

[31] van der Veer et al. (2015).

[32] AIFMD Article 25(3).

practice, hedge funds often impose redemption restrictions which allow them to pursue more risky investment strategies by limiting outflows in the case of low performance. The minimum time investors have to wait to withdraw shares from hedge funds differs from less than one month to over eight months, reflecting different hedge fund strategies but also differences between funds with similar strategies.[33]

From a macroprudential perspective, an alignment between redemption terms and the use of leverage in funds is desirable. The choice of redemption terms by AIFMs may also be driven by competitive reasons resulting in the offering of loose redemption terms to attract investors promising liquid investments.[34] Given that the use of leverage amplifies the potential market impact in the event of investor withdrawals (see Section 2.1) and increases the vulnerability of funds to investor runs (see Section 2.2), the combination of loose redemption restrictions with leverage is suboptimal from a macroprudential perspective. As such, and to the extent that competition for investments plays a role, redemption policies of leveraged funds may be too loose in the absence of macroprudential regulatory requirements.[35] Notably, a structural alignment between the redemption terms and the liquidity profile of fund portfolios is also important to reduce the risk of investor runs.

In general, redemption terms tend to be stricter for more leveraged AIFs in the Netherlands. Investors of substantially leveraged hedge funds have to wait on average at least 17 days before they can redeem their shares after having notified the hedge fund manager (see Chart 8). For leveraged bond funds, the average (net asset value-weighted) "redemption duration" is nine days.[36] Notably, the redemption duration for the leveraged mixed funds is slightly higher with 12 days on average, even though their use of leverage is somewhat lower than that of leveraged bond funds. Finally, marginally leveraged funds-of-funds and equity funds offer daily redeemable shares and notice periods.

However, leveraged funds-of-funds, equity funds and some bond funds offer daily notice periods and redemptions. Aside from the marginally leveraged funds-of-funds and equity funds, the substantially leveraged bond funds also offer daily notice periods in combination with daily redemptions (see Chart 9). In principle, these loose redemption terms expose these overlay funds to run risk, although the pension fund investor base and the particular role of these funds to manage interest rate risk is likely to be an important mitigating factor (see Section 3.5). Finally, the substantially leveraged hedge funds have a redemption duration of 17 days, which is somewhat lower than the average redemption duration of an international sample of

33 Hombert and Thesmar (2014).

34 Stein (2005).

35 There are also calls within the industry for a stricter alignment of fund redemption terms with the amount and type of leverage used by individual funds. For example, see BlackRock (2017).

36 We use the term "redemption duration" following Hombert and Thesmar (2014) who introduce the term duration for their measure of the minimum time in days an investor has to wait in order to "withdraw the average dollar invested in a fund", which combines a fund's notice period, redemption frequency and lock-up period. Note that, contrary to Hombert and Thesmar (2014), our measure does not account for lock-up periods as only one fund in the sample of leveraged Dutch AIFs applies a lock-up period.

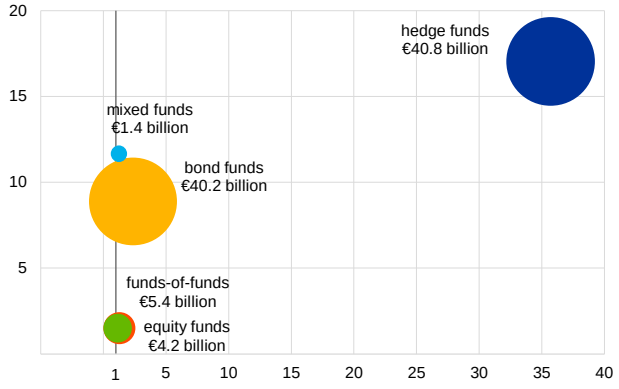
hedge funds with similar strategies.[37] At a more fundamental level, however, one could argue whether such relatively short redemption durations combined with a substantial and volatile use of leverage are desirable from a macroprudential view.

Chart 8

In general, investors have to wait longer to withdraw investments from the more leveraged funds…

Leverage and redemption terms among Dutch leveraged alternative investment funds

(bubble size: net exposure in EUR billions; x-axis: net exposure/net asset value; y-axis: notice period in days + redemption frequency in days/2)



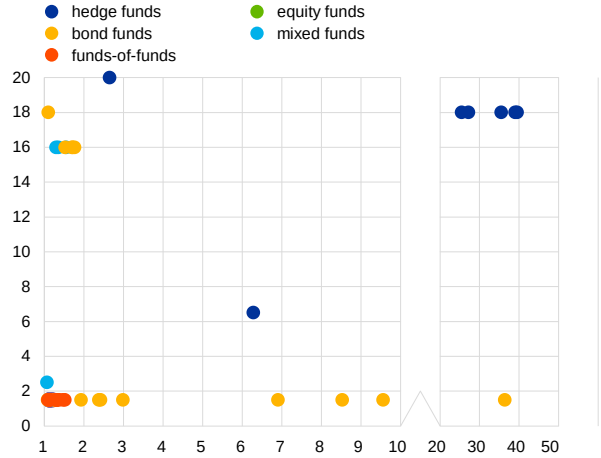
Sources: DNB, and DNB and ECB calculations.

Chart 9

…but leveraged fund-of-funds, equity funds, and some bond funds offer daily notice periods and redemptions

Leverage and redemption terms among Dutch leveraged alternative investment funds

(average quarterly values in 2016; x-axis: net exposure/net asset value; y-axis: notice period in days + redemption frequency in days/2)



Sources: DNB, and DNB and ECB calculations.

3.4 No evident liquidity mismatches in leveraged AIFs

In open-ended funds, the potential mismatch between the liquidity of fund investments and redemptions of fund shares is a key structural vulnerability. The liquidity of a fund's portfolio is central to its ability to meet redemption requests without having to fire-sell assets. Although the liquidity of fund investments differs across funds and may vary over time, open-ended funds generally offer short-term (often daily) liquidity to their investors. In the event of unanticipated large losses, investors may redeem their shares from underperforming funds to minimise further losses. In order to meet these redemptions, funds have to liquidate portfolio assets, which could result in greater market volatility with the potential to trigger further redemptions and asset sales. Notably, the FSB has assessed that global financial stability risks may have increased in recent years, as funds increasingly hold fixed income assets, have increased their exposures to less actively traded assets, and invest in asset classes that may become less liquid as risk perceptions and underlying credit conditions change.[38]

37 Hombert and Thesmar (2014).

38 Financial Stability Board (2017).

The use of leverage further increases funds' vulnerability to liquidity risk. Aside from leveraged funds' higher vulnerability to investor runs (see Section 2.2), the use of financial leverage through borrowings or securities financing transactions increases a fund's funding liquidity risk, as lending costs or margin requirements can increase. In turn, the use of leverage via derivatives increases a fund's sensitivity to shocks in derivatives markets and the risk of margin calls caused by small downward price fluctuations. As such, the portfolio of leveraged funds needs to be highly liquid and a structural mismatch between the portfolio liquidity and the redemption terms of leveraged funds is undesirable from a macroprudential view.

However, measuring portfolio liquidity is intrinsically difficult, as it involves assessing market liquidity for a portfolio of assets traded in different markets which can change abruptly. The framework to assess financial stability risks from investment funds (see Table 1) includes three indicators to assess funds' portfolio liquidity and the potential for liquidity mismatches. The first indicator is the difference in days between funds' redemption duration and the time it takes to liquidate the full portfolio as reported by the asset managers. In addition to this measure, which relies on the evaluation of individual asset managers, the framework includes an indicator which measures the ratio of funds' net asset value to "highly liquid assets", as distinct from "less liquid" and "inherently illiquid" assets. Importantly, while the assets assigned as highly liquid follow general market conventions, even these assets may experience times of reduced market liquidity. For example, episodes like the US Treasury bond "flash crash" in October 2014 and the "Bund tantrum" in April/May 2015 have shown that even government bonds of advanced economies – which are assumed to be highly liquid – can experience periods of reduced liquidity. Finally, the third indicator measures the share of funds' investments in inherently illiquid assets, such as physical assets, unlisted equities, non-investment-grade bonds and loans.

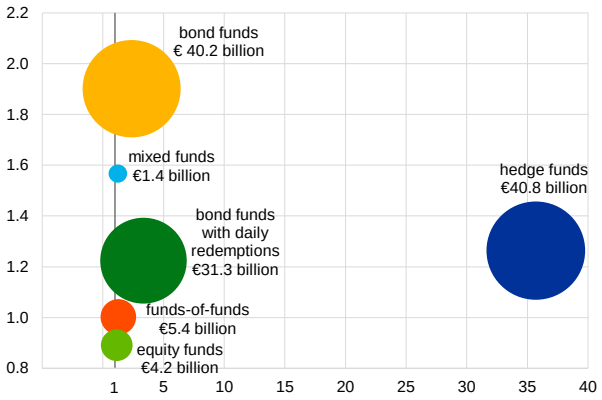
Overall, the available indicators do not suggest that Dutch leveraged AIFs have a structural liquidity mismatch. Asset managers generally report that the number of days it would take to liquidate the full portfolio is equal to, or even shorter than, the portfolio's redemption duration. Based on this indicator, fewer than five individual funds with a total net exposure of €3.5 billion have a structural liquidity mismatch. In turn, leveraged funds which offer daily redemptions and notice periods (i.e. funds-of-funds, equity funds and a majority of the bond funds) have portfolios composed of only or mostly highly liquid assets (see Chart 10). Moreover, while the leveraged bond funds with short-term redemptions have a somewhat less liquid portfolio, there is no further evidence of a mismatch between their redemption duration and portfolio liquidity and they have no investments in illiquid assets (see Chart 11). Notably, this stands in contrast to the sample of quarterly reported unleveraged bond funds, which on average report a considerable structural mismatch and significant share of investments in illiquid assets. Finally, and more generally, with the exception of one leveraged mixed fund, none of the leveraged AIFs hold a significant share of illiquid assets on their balance sheets and most funds do not invest in illiquid assets.

Chart 10

Leveraged bond funds are relatively illiquid compared with other leveraged funds with daily redemptions…

Leverage and liquidity mismatch among Dutch leveraged alternative investment funds with daily redemption duration

(bubble size: net exposure in EUR billions; x-axis: net exposure/net asset value; y-axis: liquidity mismatch measured as the net asset value to highly liquid assets)



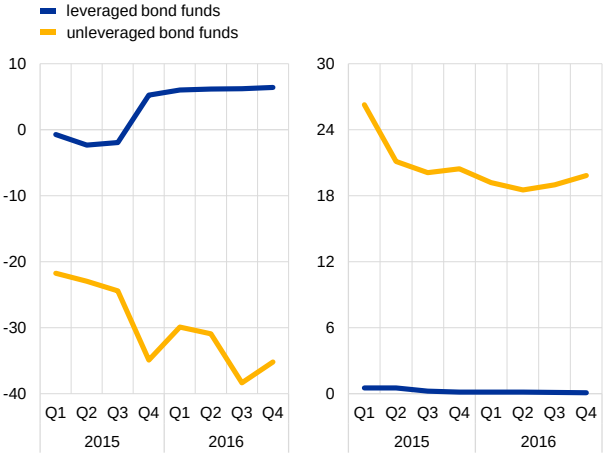
Sources: DNB, and DNB and ECB calculations.
Note: highly liquid assets include cash and cash equivalents (deposits, commercial papers and others), listed equities, investment grade securities issued by financial institutions, EU and G10 non-EU government bonds, and investment fund shares.

Chart 11

…but other indicators suggest that leveraged bond funds do not have a liquidity mismatch

Liquidity mismatch and illiquid assets within Dutch leveraged and unleveraged alternative bond funds

(y-axis chart left: liquidity mismatch measured as difference between the duration in days and the portfolio liquidity in days as perceived by the asset manager; y-axis chart right: illiquid assets in percent of net asset value)



Sources: DNB, and DNB and ECB calculations.
Notes: unleveraged bond funds include quarterly reporting funds only and represent a total net asset value of €27.3 billion. Illiquid assets include physical assets, unlisted equity, non-investment-grade corporate and convertible bonds, and loans.

3.5 Insurers and pension funds strongly linked to leveraged AIFs

Leveraged AIFs are by definition strongly interconnected with other financial institutions. The use of financial and/or synthetic leverage via derivatives creates direct linkages between investment funds and counterparties, such as broker-dealers, banks, central counterparties (in the case of centrally-cleared repurchase agreements and derivatives), insurance companies and other investment funds. In addition, AIFMs may have a financial institution as parent company, which is often a bank, insurer or pension fund. Moreover, as AIFs are particularly marketed to professional investors, various financial institutions also invest in investment fund shares.[39] Finally, AIFs can invest in financial institutions and instruments, which creates a further layer of interconnectedness.

These linkages create potential channels for direct spillovers of investment fund stress to the broader financial system. Counterparty linkages between leveraged AIFs and other financial institutions allow financial stress to be transmitted from the fund to the broader financial system and vice versa. In turn, banks and

[39] Under the AIFMD, Member States are able to allow the marketing of all or certain types of AIFs managed by AIFMs to retail investors in their territory. If this is allowed under national law, then the Member State should make an assessment on a case-by-case basis to determine whether a specific AIF should be considered a type of AIF which may be marketed to retail investors and should in such cases be able to impose stricter requirements on AIFs and AIFMs as a precondition.

insurers which own asset managers may be inclined to step in and provide liquidity to troubled investment funds for reputational reasons.[40] Such liquidity support can limit investment funds' fire sales of assets, but may also act as a contagion channel for banks and insurers. Further, systemic risk could arise due to (i) sudden stops in providing liquidity and short-term funding to financial institutions, (ii) sudden reductions in market liquidity for financial instruments that are important to credit intermediation, and (iii) insufficient risk separation.[41] Finally, financial institutions naturally face losses following the bad performance of AIFs in which they are invested.

Linkages between AIFs and financial institutions with a long-term investment horizon, however, may mitigate the potential for investor runs. The actual risk of redemptions varies from fund to fund and depends, for example, on the fund's investment strategy and liquidity management, but also on the investment horizon of the fund's participants. In particular, the potential of an investor run may be significantly reduced when insurance companies and pension funds (ICPFs) hold a majority of fund shares. ICPFs tend to have a long-term investment horizon and are also able to sit out a downturn in the market.[42] In addition, pension funds often rebalance their investment portfolios – they buy securities when prices are low and sell them when prices are high – which can help to stabilise market shocks.

ICPFs have strong ties with Dutch leveraged AIFs, both as owners of asset management companies and as investors in the leveraged funds. The asset management sector is dominated by managers who are part of an insurance group. Of all leveraged funds, with the exception of the hedge funds, between 51.7% of the bond funds and 96.1% of the equity funds are managed by such a company (see Chart 12). Pension funds only have a considerable ownership share in the managers of leveraged bond funds, with a market share of 43.5%.[43] In terms of the investor base, ICPFs are strongly linked to all leveraged fund types, with their combined share ranging from 60.1% of the hedge funds to 98.2% of the equity funds. Banks are only marginally invested in leveraged funds with a maximum share of 4.2% in the case of mixed funds. Furthermore, banks only have a relevant ownership share of 27.7% of the asset managers of the relatively small leveraged mixed funds.

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40 For example, two hedge funds run by Bear Stearns had trouble meeting margin calls, leading the firm to inject USD 3.2 billion in June 2007 in order to protect its reputation. See Brunnermeier (2009) and Bengtsson (2014) for an overview of the literature and some recent examples of fund sponsor support.

41 Bengtsson (2016).

42 Despite the longer investment horizon, there are indications of procyclical investment behaviour by Dutch insurers during the global financial crisis and European sovereign debt crisis. See Bijlsma and Vermeulen (2016) and Duijm and Steins Bisschop (2015).

43 Notably, the particular involvement of funds in joint accounts of pension administration organisations (PUOs) is a key feature of the Dutch investment fund sector as a whole. About three-quarters of the investment fund sector consists of exclusive funds where one main pension fund sponsor holds a comfortable majority of the participations (over three-quarters of the assets on average) and the other participants consist of a limited number of other pension funds. The structure of these exclusive funds means the risk of a run is almost nil (for more details, see Box 2.1 in van der Veer, Klaaijsen and Roerink, 2015). Of the 49 leveraged AIFs considered in this paper, however, only one (but large) bond fund is such a vehicle that holds assets for a single pension fund and a few small ones. As such, the particular role of PUOs is much less relevant in Dutch leveraged funds.

Stress in the Dutch hedge fund sector may affect some international broker-dealers and banks acting as counterparties and lenders. Dutch hedge funds use only a small number of international broker-dealers and banks as counterparties to their large derivatives portfolios. Some of these institutions also provide loans or lend securities to the hedge fund sector, which allows for the build-up of financial leverage. Given the substantial use of leverage in the hedge fund sector, in particular via the use of derivatives, these counterparty linkages are likely to be a primary channel of potential negative spillovers in the event of stress.

Finally, the scope for negative spillovers via reductions in investments by Dutch leveraged AIFs in financial institutions is limited. The leveraged AIFs only have a marginal share of their portfolio invested in equities and bonds issued by financial institutions.[44] Only the investments by leveraged bond funds are of economic relevance, with a total value of €1.6 billion or 9.8% of their net asset value. In turn, the investments in structured and securitised products are economically insignificant, with a total value invested in such products of only €103 million. Therefore, the portfolio investments of the Dutch leveraged AIFs are not particularly concentrated in financial institutions, which reduces the scope for negative spillovers to the financial system via this channel.

3.6 Corporate bond investments by leveraged AIFs are limited

Finally, deleveraging of fund investments in corporate bonds could be another potential channel through which systemic risk could be amplified. Since the global financial crisis, corporate bond financing in the euro area has increased as a proportion of total bond and bank loan finance outstanding from around 7% to 12%. In turn, the share of euro-area open-ended investment funds in corporate bond financing has significantly increased from around 15% to over 25% since 2009. In this context, large-scale redemptions could result in asset sales and repricing in corporate bond markets with a potential for systemic risk.[45] To the extent that funds use leverage, this could further contribute to an excessive provision of debt financing and to the risk of an even stronger reversal when the corporate credit cycle turns.

[44] Notably, the AIFMD reporting framework does not include a further distinction of equities and bonds issued by type of financial institutions such as, for example, banks or insurers.

[45] European Central Bank (2017). Notably, Goldstein, Jiang and Ng (2017) find evidence pointing to the potential fragility of corporate bond mutual funds, where the illiquidity of corporate bonds may generate a first-mover advantage among investors, amplifying their response to bad performance.

Chart 12

Direct linkages between Dutch leveraged AIFs and other financial institutions

For every leveraged fund type, the chart shows the: i) ownership share of banks, insurers, pension funds, and independent asset managers, ii) share of banks, insurers, and pension funds in the investor base, and iii) the size of investments in financial institutions.

Sources: DNB, and DNB and ECB calculations.

In the extreme, redemptions from open-ended investment funds can lead to dislocations in European corporate bond markets.[46] A study by the Bank of England observes that, while individual funds may pass all risk onto their investors, short-term redemptions can create procyclicality. In particular, it is shown that fund redemptions can cause material increases in spreads in the European corporate bond market and that market shocks now have the potential to cause more damage, as the sector has grown since the global financial crisis.[47] Moreover, the study shows that investor redemptions which are one-third higher than those observed during the crisis could be sufficient to overwhelm the capacity of dealers to absorb those sales, resulting in market dysfunction. While unlikely, such an event may not be impossible.

Dutch leveraged alternative bond funds have only limited investments in corporate bonds and almost exclusively in investment-grade bonds. Investments in corporate bonds by leveraged alternative bond funds had a total value of €1 billion in the fourth quarter of 2016, which is equal to 5.9% of their total net asset value (see Chart 13). These investments were relatively small compared with the outstanding corporate bond investments of €8.9 billion – representing 27.3% of total net asset value – of quarterly reporting unleveraged bond funds. In addition, leveraged funds had virtually no investments in the more risky non-investment-grade corporate bonds. On the other hand, unleveraged funds had about two-fifths of their corporate bond portfolio invested in non-investment-grade bonds, with an absolute value of €3.7 billion in the fourth quarter of 2016 (see Chart 14).

46 Bank of England (2017).

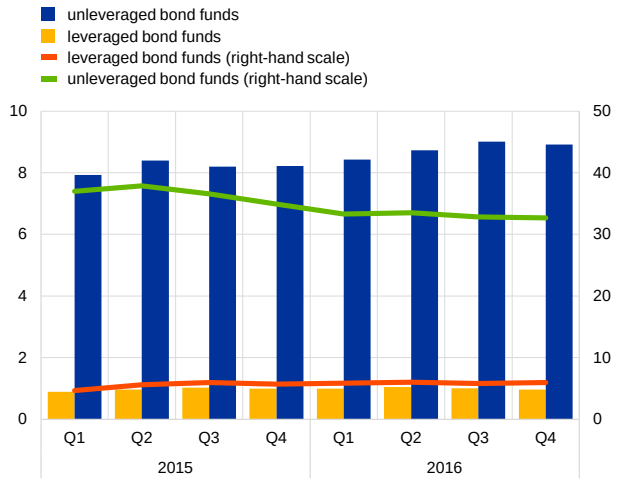
47 The exercise finds that weekly levels of redemptions from funds equivalent to 1% of their total assets – levels experienced in the financial crisis – could increase corporate bond interest rates for companies with high credit ratings by around 40 basis points, which compares to an estimated price impact of around 25 basis points during the crisis.

Chart 13

Leveraged bond funds have limited corporate bond investments compared to unleveraged bond funds...

Investments in corporate bonds by Dutch alternative bond funds

(left y-axis: investments in corporate bonds in EUR billions; right y-axis: investments in corporate bonds as percentage of net asset value)



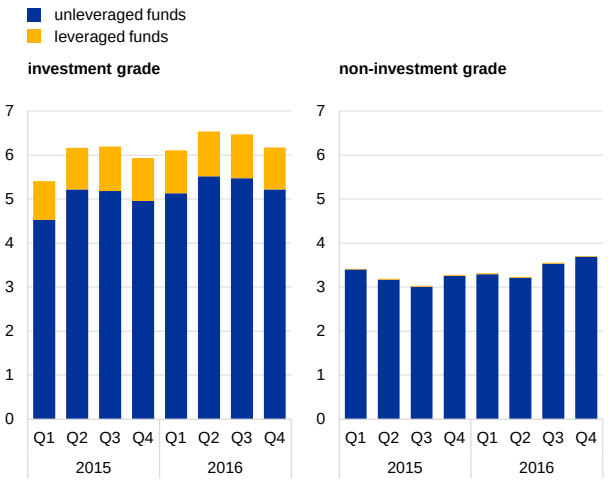
Sources: DNB, and DNB and ECB calculations.
Note: unleveraged bond funds include quarterly reporting funds only and represent a total net asset value of €27.3 billion.

Chart 14

…and virtually no investments in non-investment-grade corporate bonds

Investments in corporate bonds by Dutch alternative bond funds

(y-axis: investments in corporate bonds in EUR billions)



Sources: DNB, and DNB and ECB calculations.
Note: unleveraged bond funds include quarterly reporting funds only and represent a total net asset value of €27.3 billion.

4 A framework to design macroprudential leverage limits for AIFs

The international nature of the investment fund sector calls for international coordination when designing macroprudential policies such as leverage limits. At this stage, and in addition to a common risk assessment framework, authorities in Europe would benefit from a common framework to guide the potential design of macroprudential leverage limits. This chapter aims to contribute to the development of such a framework by analysing the effectiveness and efficiency of various design options in line with the ESRB's approach to developing macroprudential instruments. The analysis, which is also supported by findings for the Dutch leveraged AIFs, suggests that constant leverage limits targeted at economic leverage and taking into account the redemption and/or liquidity profile of funds should be explored at the EU level as an initial step. Adding time-varying aspects creates further complexity in the calibration, which warrants additional analyses in the longer term.

4.1 Macroprudential leverage limits need international coordination

The alternative investment fund sector has an international nature. Fund managers can set up funds in other jurisdictions. Moreover, fund managers can relocate their offices to another jurisdiction. Funds can also have an international reach through their investment in cross-border assets, trade relations with counterparties and through their investor base.

Policy coordination at the European level is required to avoid regulatory arbitrage and unintended spillovers. The AIFMD allows national competent authorities to limit the leverage of funds managed by AIFMs that reside in their jurisdiction. Owing to the mobility of fund managers and funds, policy coordination is needed to avoid regulatory arbitrage and to maintain a level playing field. The international reach of funds through their investment, counterparties, and investor base also warrants policy coordination among authorities, owing to the possibility of unintended spillovers of policy measures to other jurisdictions.[48]

Authorities in Europe would benefit from a common framework to guide the design, calibration and implementation of macroprudential leverage limits. The AIFMD provides two measures of leverage (gross and commitment) but gives no further guidance on how authorities should design, calibrate or implement macroprudential leverage limits. This poses a challenge for authorities that want to operationalise and coordinate this macroprudential instrument.

[48] For instance, there is a need for further clarification of the respective roles and cooperation of national competent authorities in the activation of leverage limits, where the fund is established in one jurisdiction but the fund manager is established in another.

The aim of this chapter is to contribute to the development of a common framework by discussing several key elements and using findings for the Dutch AIF sector to suggest some concrete design options that could be further explored at EU level. It first discusses how the available leverage measures under the AIFMD can be used for the implementation of leverage limits and then proposes a framework that authorities can use to assess the effectiveness and efficiency of the different types of constant and cyclical leverage limits they may want to consider.

4.2 Leverage limits should restrict economic leverage

Leverage limits should be based on leverage measures reported under the AIFMD, in order to enhance consistent application and transparency and avoid regulatory arbitrage. Setting leverage limits based on a common measure would help authorities achieve consistent application of leverage limits in Europe. This would limit regulatory arbitrage by fund managers and prevent leakages. Moreover, it would enhance transparency of the policy measure and aid its implementation. Taking note of the complexities in measuring leverage, authorities should ideally build on existing concepts and measures used for reporting leverage under the AIFMD. Potential future improvements in the measurement of leverage are automatically and consistently taken into account through the regular review process.

In principle, authorities should base leverage limits on the net measure of leverage since this will target economic exposure. Leverage limits should first and foremost be geared towards limiting economic leverage, i.e. the leverage that increases the fund's risk-return profile. This means that the fund manager's efforts to net and hedge risks should be taken into account. By implication, the net leverage measure of the AIFMD would be the default measure for the implementation of leverage limits. Notably, the Basel III leverage ratio allows for some netting of derivatives and therefore shares some similarities with the net leverage method under the AIFMD.

Authorities that are concerned with fire sales and contagion risks stemming from failing netting and hedging sets in times of stress may also want to consider limits on the gross measure of leverage. In some circumstances authorities may prefer to implement limits on the gross leverage measure. This could be the case when funds – for instance hedge funds – have a substantial gross exposure but a small net exposure owing to substantial netting and hedging in the securities and derivatives portfolio. Although the risks may be offset under normal market conditions, the fund may be substantially exposed and prone to corrective actions when normal correlations break down or important counterparties default. For example, a counterparty default or unexpected market shock may result in a sudden jump in exposure which could force the fund to fire sell assets in order to obtain sufficient liquidity to overcome margin calls. Authorities can mitigate systemic risk arising from the breakdown of netting and hedging sets by imposing limits on the gross measure of leverage.

4.3 Leverage limits should be effective and efficient

Authorities should choose leverage limits that are both effective and efficient in addressing excessive leverage. The ESRB[49] advises that authorities use a macroprudential policy strategy comprising (i) risk identification and monitoring, (ii) the definition of intermediate objectives for financial stability, and (iii) the design of instruments that are effective and efficient in meeting the intermediate policy objectives.[50]

Leverage limits for alternative investment funds are effective if they address the risk of (i) fire sales, (ii) spillovers to financial counterparties, and (iii) disruptions in credit intermediation. By addressing these market failures, the leverage limits contribute to financial stability. In terms of the ESRB's intermediate objectives, the leverage limits target the "risk of excessive leverage".

In order for the leverage limit to be efficient, it is important that the instrument is simple, and that unintended consequences are contained. Authorities should choose limits that are easy to calibrate and implement. This promotes transparency and avoids inaction. Moreover, unintended consequences – for example, behavioural changes, such as a shift to higher-yielding assets – should be contained. Leverage limits should be robust to gaming and arbitrage by market participants. Furthermore, leverage limits should be proportional to the systemic risk to be addressed, to ensure that the sector remains able to provide valuable services to the economy. For instance, funds should still be able to employ diverse and active strategies which can act as a shock absorber during market stress. Table 2 provides a framework for evaluating design options for leverage limits in terms of effectiveness and efficiency.

A "one-size-fits-all" limit would be simple to implement but could have large unintended consequences because it would make some business models unviable. A "one-size-fits-all" limit is effective if it is binding for a large share of the fund sector. However, such an approach could make some business models, for example hedge funds, unviable. Moreover, a restrictive "one-size-fits-all" limit could significantly reduce the sector's ability to absorb market shocks to the extent that fund managers would invest actively and go against the market trends. The Dutch case, where substantial leverage is concentrated in hedge funds and some bond funds, exemplifies this.

[49] European Systemic Risk Board (2016) and (2017b).

[50] European Systemic Risk Board (2013).

Table 2

A framework for assessing the effectiveness and efficiency of various designs for macroprudential leverage limits

Relative effectiveness and efficiency of constant "one-size-fits-all", fund-type and fund-profile limits, and first considerations regarding cyclical limits

(green = the measure is deemed effective/efficient in meeting the criterion; yellow = the measure is deemed only partially effective/efficient in meeting the criterion; red = the measure is deemed not to be effective/efficient; grey = no conclusion can be drawn at this stage regarding the effectiveness/efficiency of the measure

Leverage limit design options		Constant leverage limits			
		1	2	3	
		One-limit-fits-all	Limits per fund type	Limits per fund profile	Cyclical limits
Effectiveness	Fire sales	Effective in limiting all market failures if the limit is binding for a large share of leveraged funds	Effective in limiting all market failures if the limits are binding for a large share of leveraged funds	Effective when targeting leveraged funds with relatively illiquid portfolios and/or short redemption terms	Design options 1 to 3 could be applied in a time-varying way. The designs would have the same effect, but cyclical leverage limits would be better suited to limit the build-up of risks in the upswing and materialisation of risks in the downswing of the financial cycle
	Counterparty & interconnectedness externality			Effective when targeting leveraged funds with strong direct linkages to financial institutions	
	Excessive credit intermediation			Effective when targeting leveraged funds which invest in corporate bonds and loans	
Efficiency	Proportional	A low limit could make fund types (i.e. hedge funds) unviable, while a high limit will fail to prevent a general build-up of leverage	Limits target fund types with relatively high leverage (e.g. hedge funds), but do not differentiate between risk profiles within a fund type	Limits target different general fund risk profiles across fund types	The proportionality would depend on the chosen design option
	Robust to gaming & arbitrage	No scope for gaming & arbitrage	Some scope for gaming & arbitrage as mixed funds could try to obtain a more favourable fund classification	Gaming & arbitrage opportunities unlikely with small number of strictly defined profiles	The scope for gaming & arbitrage would depend on the chosen design option
	Complexity of calibration	Simplest design option	Relatively simple with small number of strictly defined fund types	Relatively simple with small number of strictly defined fund profiles	Requires a leverage cycle indicator and measure of funds' contribution, which adds a layer of complexity to the calibration

Sources: DNB and ECB.
Notes: The table below evaluates three design options for constant leverage limits and briefly touches upon cyclical limits. These examples do not represent an exhaustive set of options, and the evaluation given below should be viewed as an example of how the framework for evaluating different design options could be used. The effectiveness of a certain leverage limit is determined by its ability to address the risk of fire sales, counterparty and interconnectedness externalities, or excessive credit intermediation. A leverage limit is deemed efficient if the impact of the measure is proportional to the financial stability risks, if the measure is robust to gaming and if the measure simple to understand and implement.

Leverage limits based on fund type and/or profile are likely to be the most useful option for the short to medium term, because they allow authorities to target those funds that contribute most to systemic risk. Several options could be considered regarding differentiation according to fund profile. For instance, authorities that wish to address the risk of fire sales could consider imposing limits on funds that offer short-term redemptions or consider investing in illiquid assets. As shown in Chapter 3, redemption restrictions in the Netherlands do not appear to be strictly aligned with the use of leverage in all cases (see Box 3 for further considerations on macroprudential leverage limits for funds that offer short-term redemptions). Alternatively, authorities that are concerned about direct contagion to counterparties may want to consider imposing leverage limits on funds that have large or concentrated exposures to other financial institutions. Authorities could also cater for differences in overall levels of leverage by differentiating limits according to fund type. A drawback of this option might be that funds could try to game limits by trying to obtain a more favourable fund classification under the AIMFD[51]. However,

[51] Under the AIFMD, fund managers can choose the fund type.

the scope for gaming could be reduced if criteria for determining the fund type were to be introduced.

Finally, cyclical leverage limits could be explored in the future. Authorities could also consider applying a "one-size-fits-all", fund-type or fund-profile limit in a cyclical fashion. Compared with the constant leverage ratio version of each of these limits, cyclical limits would be better suited to dampen the build-up and materialisation of risks in the upswing and downswing of the financial cycle. However, for the short to medium term, a cyclical approach would not be feasible, as this requires a measure for the financial cycle and an indicator for funds' contribution, which adds an additional layer of complexity to this measure.

Box 3
Considerations on macroprudential leverage limits for funds with short redemption terms

Competitive pressures in the asset management sector may have led to excessive offering of short-term redemptions and an increase in the risk of investor runs. In an analysis of the US market, Stein (2005) observes that the majority of mutual funds and hedge funds are open ended, even though this impedes fund managers from executing long-term investment strategies (e.g. arbitrage) that would benefit both investors and the broader economy. Stein argues that fund managers use the offering of short-term redemptions to signal their quality and to attract investors. Because the asset management industry is a highly competitive market, this behaviour leads to an excessive level of open-ended funds that offer short-term redemptions. This makes the sector more prone to runs. The fear of runs, in turn, causes fund managers to hoard cash in times of low market liquidity and stress, which adds to the risk of procyclical buying and selling in the financial system (Liu and Mello, 2011).

The risk of investor runs is higher for funds with larger liquidity mismatches and funds that use leverage. There is ample evidence that the run risk of open-ended funds is higher for funds that have large liquidity mismatches and funds that are leveraged. For instance, Chen et al. (2010) show that illiquid funds are more prone to investor outflows after bad performance than liquid funds. Given that selling off illiquid assets is more costly than selling liquid assets, investors have a greater incentive to be the first to exit the fund. Chen et al.'s results are consistent across fund types. Agarwal et al. (2016) find similar evidence for the funds-of-funds industry and show that liquidity mismatches make funds-of-funds more vulnerable to investor runs. Goldstein et al. (2017) find the same first-mover advantage for bond funds that invest in illiquid corporate bonds and Schaub and Schmid (2013) find evidence for the hedge fund industry. The analysis in Chapter 2.2 suggests that leverage also amplifies investor outflows after negative returns. The prospect of costly deleveraging in the event of bad performance and the expectation of investor outflows may create an incentive for investors to "run".

A leverage limit for funds that offer short-term redemptions could contribute to financial stability, as it forces fund managers to lower the level of leverage or opt for longer redemption periods. An example of such a leverage limit would be to prohibit the use of leverage for funds that offer daily to monthly redemptions. The effect of the limit would be to reduce the risk of investor runs and fire sales through two channels. First, fund managers that offer daily to monthly redemptions could choose to reduce their leverage. This would make the fund less sensitive to runs and fire sales. Alternatively, a fund manager who wishes to keep the fund leveraged could opt to

restrict redemptions, i.e. the manager could close the fund or set a longer redemption period. By restricting outflows, the fund manager also reduces the fund's sensitivity to runs and therefore fire sales. Indeed, Hombert and Thesmar (2014) find evidence that fund managers who impose contractual restrictions on outflows overcome this run risk and are better able to maintain their long-term investment strategies.

Leverage limits for funds offering short-term redemptions can be effectively implemented, since the AIFMD allows for the application of the instrument to both new and existing funds. The implementation of leverage limits is effective if it immediately applies to both new and existing funds. One concern regarding the implementation of leverage limits for existing funds is that this would go against the contractual agreements between fund manager and investors, laid down in the fund's prospectus. However, it is not uncommon for fund managers to change the strategy and redemption characteristics over the lifetime of the fund. In addition, the AIFMD does not preclude the application of leverage limits to existing funds.

5 The way forward: building an EU-level framework

This joint ECB-DNB Occasional Paper is a further step towards developing an EU-level framework for macroprudential leverage limits for AIFs. The ESRB has recently identified the operationalisation of macroprudential leverage limits under the AIFMD as one of the key short to medium-term tasks. This study has aimed to contribute to this goal in three ways. First, it presented new evidence showing that leveraged European AIFs are more vulnerable to investor outflows than unleveraged funds. Second, building on an earlier ECB-DNB special feature article, it devised a framework for assessing financial stability risks from leverage in investment funds and applied the framework to leveraged funds within the Dutch AIF sector. Finally, it developed a framework for assessing the effectiveness and efficiency of different designs for macroprudential leverage limits, in line with the ESRB's approach to developing macroprudential instruments.

Guidance from ESMA, in close cooperation with the ESRB, on the frameworks needed for the operationalisation of macroprudential leverage limits would further support a harmonised approach within the EU. Under the AIFMD, ESMA has an important coordination role to ensure that a consistent approach is taken by competent authorities in the operationalisation of macroprudential leverage limits. At this stage, ESMA is building a database in which the nationally reported AIFMD data is aggregated at EU level. This database is key to the further development of an EU-level risk assessment framework and any future operationalisation of macroprudential leverage limits. Once ready, these data should be analysed jointly with macroprudential authorities within the ESRB in order to develop a common EU-level framework. In particular, such an EU-level analysis is required to eventually move towards defining quantitative thresholds for the implementation and calibration of macroprudential leverage limits.

The forthcoming AIFMD review provides an opportunity to resolve any remaining barriers to the operationalisation of macroprudential leverage limits. The AIFMD, which was introduced in mid-2013, is scheduled to be reviewed for the first time in 2018. Importantly, this review should be used to resolve any potential barriers to implementing macroprudential leverage limits. For example, as noted in this study, one important issue is the lack of reporting on the details of the leverage calculation by asset managers. While the current AIFMD reporting framework seems to provide sufficient information for solid risk assessment, further details on how asset managers calculate their reported leverage level – as is available to supervisors in the context of the bank leverage ratio – would seem necessary for any future implementation and supervision of macroprudential leverage limits.

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