

# Special features

## A Towards a framework for calibrating macroprudential leverage limits for alternative investment funds<sup>87</sup>

*Alternative investment funds (AIFs) in Europe operate without regulatory leverage limits. Competent authorities within the EU have the legal power to impose macroprudential leverage limits on AIFs, but no authority has implemented this tool so far. This joint European Central Bank-De Nederlandsche Bank (DNB) special feature (i) presents a macroprudential case for limiting the use of leverage by investment funds, (ii) develops a framework to inform the design and calibration of macroprudential leverage limits to contain the build-up of leverage-related systemic risks by AIFs, and (iii) discusses different design and calibration options. By way of example, it uses supervisory information on AIFs managed by asset managers based in the Netherlands. The article concludes by recommending a way forward to develop an EU-level framework for a harmonised implementation of macroprudential leverage limits for AIFs, which forms a key part of the agenda of the European Systemic Risk Board (ESRB) to develop macroprudential policy beyond banking.<sup>88</sup>*

### Introduction

**Since the global financial crisis, the investment fund sector has expanded rapidly and this growth has been accompanied by increased risk-taking.** Since 2008 total net assets of European investment funds more than doubled from €6.2 trillion to €13.3 trillion in the second quarter of 2016.<sup>89</sup> Notably, in the same period, the size of European alternative investment funds more than tripled from €1.6 trillion to €5.2 trillion.<sup>90</sup> While this growing role of funds in credit intermediation and capital markets provides useful diversification benefits for the real economy, risks are increasing as funds have shifted their holdings from higher to lower-rated debt securities, hold a decreasing share of liquid assets, and continue to expand their exposure to emerging markets.<sup>91</sup> Moreover, in the current “low-for-long” interest rate environment, such risk-taking in search of yield is likely to continue.

**Policymakers at the European and global levels are discussing ways to strengthen regulation for asset management, including on the use of leverage.** Central banks, markets and securities regulators have all expressed concerns about

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<sup>87</sup> This special feature was prepared by Koen van der Veer, Anouk Levels (DNB), Raymond Chaudron (DNB), Michael Grill, Luis Molestina Vivar, Monica Petrescu and Christian Weistroffer.

<sup>88</sup> *Macroprudential policy beyond banking: an ESRB strategy paper*, ESRB, July 2016.

<sup>89</sup> *Trends in the European Investment Fund Industry in the Second Quarter of 2016*, European Fund and Asset Management Association, September 2016.

<sup>90</sup> Notably, starting in 2014, AIFs are classified according to the regulatory definition in the Alternative Investment Fund Managers Directive. Since then, net assets have increased by 28%.

<sup>91</sup> *Financial Stability Review*, ECB, May 2016.

potential financial stability risks stemming from the asset management industry.<sup>92</sup> Importantly, the Financial Stability Board (FSB) has recently published its proposed policy recommendations to address structural vulnerabilities from asset management activities.<sup>93</sup> Apart from regulatory responses to address liquidity mismatches, risks related to securities lending activities and operational risk, the FSB recommends that authorities monitor the use of leverage by funds and take action when funds pose significant leverage-related risks to the financial system.

**Alternative investment funds operate without regulatory leverage limits.** Since mid-2013, AIFs in Europe have been regulated under the Alternative Investment Fund Managers Directive (AIFMD). These funds currently account for 39% of the European investment fund sector and include various types of funds such as mixed funds, bond funds, (private) equity funds, real estate funds, funds-of-funds, hedge funds, and money market funds. Under the AIFMD, funds are required to report their use of leverage, but operate without regulatory leverage limits.

**To date, competent authorities within the EU have not used their 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 managers employ in their AIFs 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”. So far, however, no authority has implemented this tool, and a framework at the EU level to support a harmonised implementation of macroprudential leverage limits has yet to be developed.

**This joint ECB-DNB special feature aims to contribute to the development of an EU framework for implementing macroprudential leverage limits for AIFs.** It presents a macroprudential case for limiting the use of leverage by investment funds, develops a framework to inform the design and calibration of macroprudential leverage limits for AIFs, and discusses different design and calibration options. The options discussed focus on cross-sectional aspects, while acknowledging that time-varying aspects should also be considered – yet at a later stage.<sup>94</sup> The analysis builds on supervisory information available on AIFs managed by asset managers in the Netherlands, where the third-largest AIF population in Europe is domiciled.<sup>95</sup> Importantly, this information is used only to show how the same information available on AIFs in Europe could be used when developing a framework for a harmonised implementation of macroprudential leverage limits for AIFs.

<sup>92</sup> See *Financial Stability Report*, Bank of England, December 2015; *Report on Trends, Risks and Vulnerabilities*, No 2, European Securities and Markets Authority, 2015; *Financial Stability Review*, ECB, May 2016; *Update on Review of Asset Management Products and Activities*, Financial Stability Oversight Council, April 2016; speech by Vítor Constâncio, “Risk sharing and macroprudential policy in an ambitious Capital Markets Union”, April 2016; speech by Steven Maijor, “Measuring and assessing stability risks in financial markets”, May 2015; and speech by Mary Jo White, “Enhancing Risk Monitoring and Regulatory Safeguards for the Asset Management Industry”, December 2014.

<sup>93</sup> *Consultative Document: Proposed Policy Recommendations to Address Structural Vulnerabilities from Asset Management Activities*, Financial Stability Board, June 2016.

<sup>94</sup> The approach of setting a limit before considering time-varying aspects would be consistent with the approach taken by the Basel Committee on Banking Supervision to design the leverage ratio for banks.

<sup>95</sup> 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 EU countries (13%).

## Leverage and systemic risks

**Negative externalities due to the build-up of excessive leverage give rise to systemic risk in the financial system.** System-wide leverage becomes excessive when it makes economies prone to costly financial crises. Evidence shows that costly crises since the late 19th century have more often than not been the result of credit booms gone bust<sup>96</sup>, and the build-up of leverage and 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. Negative externalities related to excessive leverage may materialise via: (i) system-wide fire sales<sup>97</sup> to repay debts or margin calls that result in asset price declines for other market participants; (ii) spillovers to counterparties and financial networks; or (iii) restrictions on new lending that generate a credit crunch.

**Market participants can contribute to the build-up of excessive leverage when they do not internalise 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 corrective measures such as fire sales.<sup>98</sup> 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 the risk of magnifying losses.<sup>99</sup> And while evidence shows that a financial institution's contribution to systemic risk tends to increase with its use of leverage<sup>100</sup>, financial institutions typically do not internalise the costs of financial crises which may be triggered or amplified by system-wide excessive leverage.

**Investment funds can also build up excessive leverage and thereby contribute to systemic risk, providing a fundamental rationale for capping their leverage.** Investment funds can employ leverage to increase expected returns. Importantly, not only the level of leverage but also other fund features – in particular their liquidity risks – determine the excessiveness of leverage. For example, the redeemable nature of shares in open-end investment funds makes them structurally vulnerable to sudden redemptions which can affect the liquidity position of funds and trigger fire sales. Notably, this callable nature of fund shares makes fund equity different from bank equity and introduces run risk even at comparably lower levels of leverage.<sup>101</sup>

<sup>96</sup> Schularick, M. and Taylor, A. M., "Credit Booms Gone Bust: Monetary Policy, Leverage Cycles, and Financial Crises, 1870-2008", *American Economic Review*, Vol. 102(2), 2012, pp.1029-1061.

<sup>97</sup> 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 as the seller, and are therefore themselves indebted and cannot borrow more to buy the asset. See Shleifer, A. and Vishny, R., "Fire Sales in Finance and Macroeconomics", *Journal of Economic Perspectives*, Vol. 25(1), pp. 29-48.

<sup>98</sup> See Scharfstein, D. and Stein, J., "Herd Behavior and Investment", *American Economic Review*, Vol. 80(3), 1990, pp. 465-479.; and Thurner, S., Farmer, J. D. and Geanakoplos, J., "Leverage Causes Fat Tails and Clustered Volatility", *Quantitative Finance*, Vol. 12(5), 2012, pp. 695-707.

<sup>99</sup> See "Synthetic leverage in the asset management industry", *ESMA Report on Trends, Risks and Vulnerabilities*, No 2, 2016.

<sup>100</sup> Adrian, T. and Brunnermeier, M. K., "CoVaR", *American Economic Review*, Vol. 106, 2016, pp. 1705-1741.

<sup>101</sup> See also Doyle, N., Lieven, H., Molitor, P. and Weistroffer, C., "Shadow banking in the euro area: risks and vulnerabilities in the investment fund sector", *Occasional Paper Series*, ECB, June 2016, Box 3.

In addition, the investment fund sector's increasing role in credit intermediation and interconnectedness with the rest of the financial system further add to the potential for investment funds to create and/or amplify systemic costs.<sup>102</sup> Overall, systemic externalities of excessive leverage justify macroprudential policies that *pre-emptively* restrict the use of leverage, thereby improving general welfare.<sup>103</sup>

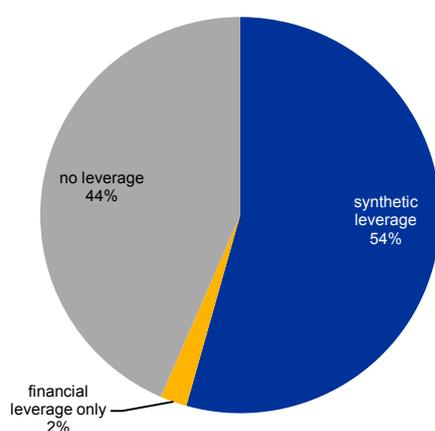
## Measuring the use of leverage by alternative investment funds

### Chart A.1

More than half of AIFs operated by managers in the Netherlands use some form of leverage

**Categorising AIFs in the Netherlands according to financial and synthetic leverage**

(net asset value)



Source: DNB.

Notes: For synthetic leverage, the maximum of reported gross and commitment leverage is considered. Financial leverage is calculated as the sum of the net asset value and (un)secured cash borrowing, divided by the net asset value.

**Investment funds can obtain financial leverage via direct borrowings and securities financing transactions, and synthetic leverage using derivatives.** Unlike financial leverage, synthetic leverage cannot be observed from balance sheets.

Derivatives allow an investor to earn a return on an underlying exposure, while committing only a small portion of equity upfront. Because derivatives are accounted for at market value, this synthetic leverage will not show up on the balance sheet and neither does the potential exposure or risk. More than half of the AIFs (in net asset value terms) in the Netherlands use some form of leverage; 54% of the funds use synthetic leverage (Chart A.1). Leverage is most prevalent in hedge funds, but other fund types can also be substantially leveraged (Chart A.2).<sup>104</sup>

**The AIFMD leverage measures incorporate both financial and synthetic leverage and provide an upper and lower bound.** Under the AIFMD, leverage is measured as the ratio of exposure to net asset value.

The exposure measure takes into account on- and off-

balance-sheet items, where derivatives are converted into cash-equivalent positions. The gross leverage ratio is based on the sum of all exposures, while the commitment leverage ratio accounts for netting and hedging.<sup>105</sup> As such, the gross leverage ratio and the commitment leverage ratio can be seen as an upper and lower bound estimation. Also, gross leverage is generally greater than or equal to financial

<sup>102</sup> *Financial Stability Review*, ECB, May 2016.

<sup>103</sup> See Bianchi, J., "Overborrowing and Systemic Externalities in the Business Cycle", *American Economic Review*, Vol. 101(7), 2011, pp. 3400-3426; and Aymanns, C. and Farmer, J. D., "The Dynamics of the Leverage Cycle", *Journal of Economic Dynamics and Control*, Vol. 50, 2015, pp. 155-179. Notably, subject to a thorough impact assessment, any final proposal on macroprudential leverage limits which directly target the use of leverage by AIFs should account for the potential interaction with instruments, such as macroprudential liquidity tools, margins and haircuts, which may also mitigate leverage-related systemic risks (see Battistini, N., Grill, M., Marmara, P. and van der Veer, K., "A case for macro-prudential margins and haircuts", Special Feature A in *Financial Stability Review*, ECB, May 2016).

<sup>104</sup> For the purpose of AIFMD reporting obligations, funds are considered to be "substantially" leveraged when the exposure according to the commitment method exceeds three times a fund's net asset value.

<sup>105</sup> For a more detailed discussion, see Box 7 in *Financial Stability Review*, ECB, May 2015.

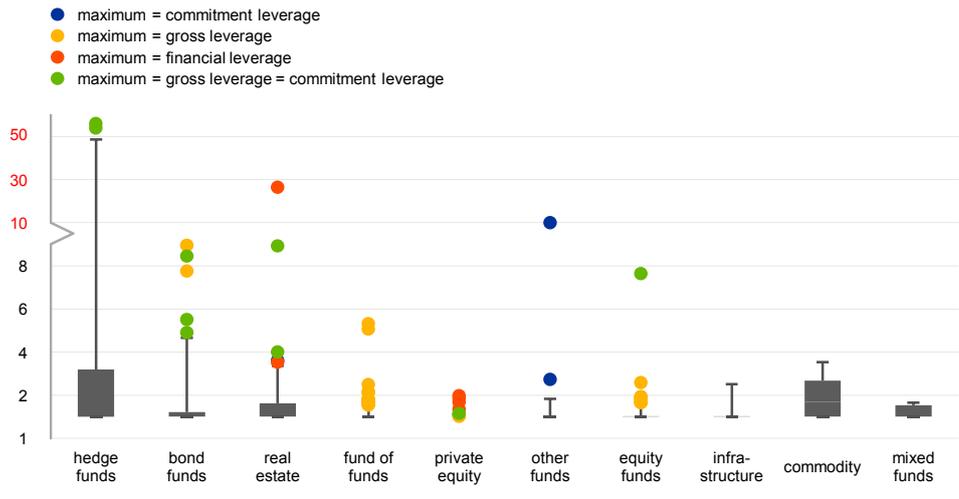
leverage.<sup>106</sup> Commitment leverage can be larger than, equal to, or smaller than financial leverage, depending on the netting and hedging by the fund.

### Chart A.2

Leverage is most prevalent in hedge funds, but other fund types can also be substantially leveraged

#### Box plot with distribution of leverage across fund types

(y-axis: maximum of synthetic and financial leverage, 1 = no leverage; x-axis: type of fund)



Source: DNB.

## Framework to design and calibrate macroprudential leverage limits

### Operationalising macroprudential leverage limits requires a framework to assess the potential contribution of funds to leverage-related systemic risks.

Macroprudential leverage limits should limit the extent to which the use of leverage contributes to the build-up of systemic risk. This requires a framework to assess whether leverage limits that are ultimately applied at the fund level effectively limit the contribution of leveraged funds to the build-up of systemic risks. Apart from information on the level, source and different usages of leverage, the framework should capture the channels through which systemic risk may materialise such as fire sales, interconnectedness with the financial system, and credit intermediation.<sup>107</sup>

**The proposed framework includes indicators that can be calculated using the information that is available under the AIFMD.** All indicators can be calculated using the supervisory data on AIFs collected by the national competent authorities in the EU. The choice of indicators is guided by the dual aim of capturing the relevant systemic risk channels, while not creating an overly complex framework. We use information from the Netherlands to visualise the indicators, each time showing the

<sup>106</sup> The AIFMD methodology excludes cash positions from the exposure measure, which could cause financial leverage to be slightly lower than gross leverage in some cases.

<sup>107</sup> Notably, while it is possible to separate these systemic risk channels in theory, they are intertwined and likely to be mutually reinforcing in reality.

distribution of funds according to their use of leverage as measured by the maximum of financial leverage and net financial and synthetic leverage.

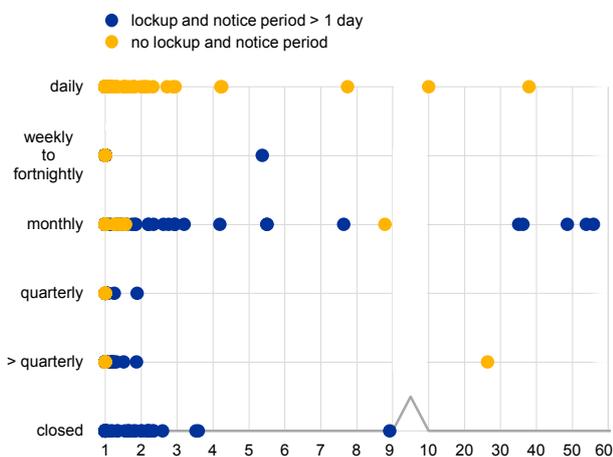
**The framework captures three aspects of fund leverage: financial leverage, net financial and synthetic leverage, and “netting and hedging dependence”.** At a general level, the use of leverage makes risk management more difficult and makes a fund more sensitive to investor outflows, i.e. given the same value of outflows, leveraged funds will have to liquidate a greater amount of assets to keep the leverage ratio constant.<sup>108</sup> 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. At a more specific level, financial leverage through borrowings or securities financing transactions increases a fund’s funding liquidity risk as lending costs or margin requirements can increase.<sup>109</sup> In turn, a higher net financial and synthetic leverage and netting and hedging dependence (e.g. the ratio of gross leverage to commitment leverage) increases a fund’s sensitivity to shocks in derivatives markets and the risk that margin calls caused by small downward price fluctuations can force a fund to fire-sell assets.

### Chart A.3

The offering of daily redemptions is not limited to AIFs with relatively low leverage

**Leverage, redemption frequency, and the existence of a lockup and notice period**

(y-axis: redemption frequency; x-axis: maximum of financial leverage and net financial and synthetic leverage reported under the commitment method, 1 = no leverage)



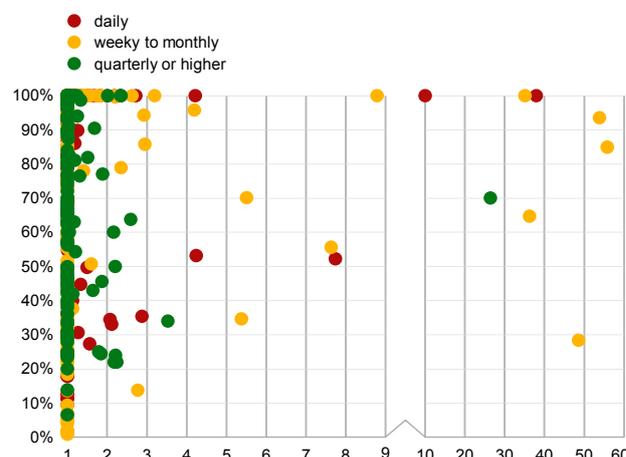
Source: DNB.  
Note: This chart excludes the exclusive funds on joint account of pension administration organisations. See footnote 26 for further details on these funds.

### Chart A.4

The investor base of leveraged AIFs can be highly concentrated

**Leverage, share of AIF equity owned by 5 largest investors, and redemption frequencies**

(y-axis: % of AIF equity owned by the five largest investors in the AIF; x-axis: maximum of financial leverage and net financial and synthetic leverage reported under the commitment method, 1 = no leverage)



Source: DNB.  
Note: This chart excludes the exclusive funds on joint account of pension administration organisations. See footnote 26 for further details on these funds.

**As a first aspect of fire-sale risk, the framework captures a fund’s redemption profile.** The offering of short-term (especially daily) redeemable claims makes funds

<sup>108</sup> Teo, M., “The Liquidity Risk of Liquid Hedge Funds”, *Journal of Financial Economics*, Vol. 100, 2011, 24-44.

<sup>109</sup> The available AIFMD data allow for a further breakdown of the source of financial leverage by: unsecured cash versus collateralised/secured cash borrowing, where the latter is further subdivided into borrowing provided via prime brokers, (reverse) repo, or other sources.

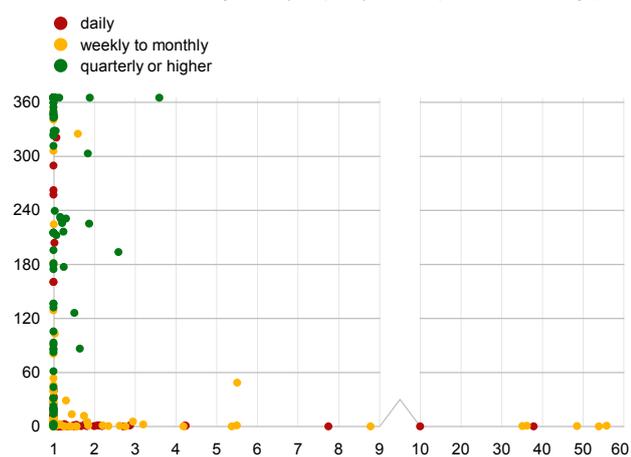
susceptible to investor runs, which could spark a fire sale. Importantly, industry-wide competition for investors can incentivise asset managers to rush to be open-ended which can lead to a suboptimal level of liquidity transformation in the financial system.<sup>110</sup> Chart A.3 shows that the offering of daily redemptions is not limited to funds with relatively low leverage. A second dimension of a fund's redemption profile is its investor base, where a higher concentration – in particular when combined with a short redemption frequency – increases the risk of fire sales as these can then be triggered when only one or a few investors decide to redeem their shares.<sup>111</sup> Chart A.4 shows that the investor base of leveraged funds can be highly concentrated.

**Chart A.5**

The most highly leveraged AIFs perceive their portfolios as highly liquid

Leverage, number of days to liquidate portfolio and redemption frequencies

(y-axis: number of days to liquidate portfolio as reported by the AIF manager; x-axis: maximum of financial leverage and net financial and synthetic leverage reported under the commitment method; categorised by frequency of redemption, 1 = no leverage)



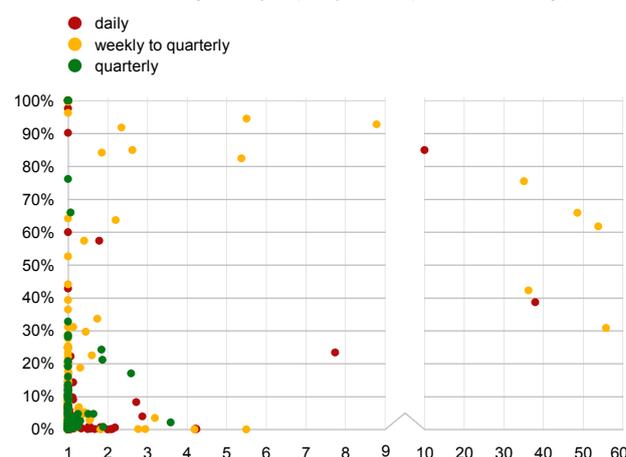
Source: DNB.

**Chart A.6**

The most highly leveraged AIFs tend to hold a relatively large cash buffer

Leverage, cash buffer and redemption frequencies

(y-axis: net cash exposures as a percentage of net asset value; x-axis: maximum of financial leverage and net financial and synthetic leverage reported under the commitment method; categorised by frequency of redemption, 1 = no leverage)



Source: DNB.

**The liquidity profile of a fund is a second aspect of fire-sale risk.** The liquidity of a fund's portfolio is central to its ability to meet redemption requests and/or margin calls without having to fire-sell assets. Measuring portfolio liquidity is, however, intrinsically difficult as it involves an assessment of market liquidity (in more than one market) which can abruptly change. The framework includes an indicator that measures the minimum number of days needed to liquidate the full portfolio as reported by the asset manager. In combination with a fund's redemption frequency, this essentially measures a fund's liquidity transformation. Chart A.5 shows that the most highly leveraged funds perceive their portfolios as highly liquid. As a more

<sup>110</sup> See Stein, J. C., "Why Are Most Funds Open-End? Competition and the Limits of Arbitrage", *Quarterly Journal of Economics*, Vol. 120(1), 2005, pp. 247-272.

<sup>111</sup> A positive relationship between investor concentration and the risk of fire sales is less likely to hold for funds that are set up by an investor that holds a large majority of the shares. Such fund structures are common in the Dutch AIF sector, where about half of the funds (in net asset value terms) consist of exclusive funds on joint account of pension administration organisations. For further details, see van der Veer, K., Klaaijnsen, E. and Roerink, R., "Shedding a clearer light on financial stability risks in the shadow banking system", *DNB Occasional Studies*, Vol. 13-7, 2015.

conservative and quantitative measure, a second indicator for the liquidity profile measures a fund's cash buffer. Chart A.6 shows that the most highly leveraged funds hold a relatively large cash buffer, which is warranted to cover margin calls.

**As a final aspect of fire-sale risk, the framework accounts for the concentration in counterparty credit exposures of a fund.** Such counterparty concentration increases the chance that a fund needs to fire-sell assets in the event of a counterparty failure. The yellow scatters in Chart A.7 show that a few substantially leveraged funds have concentrated exposures to counterparties.

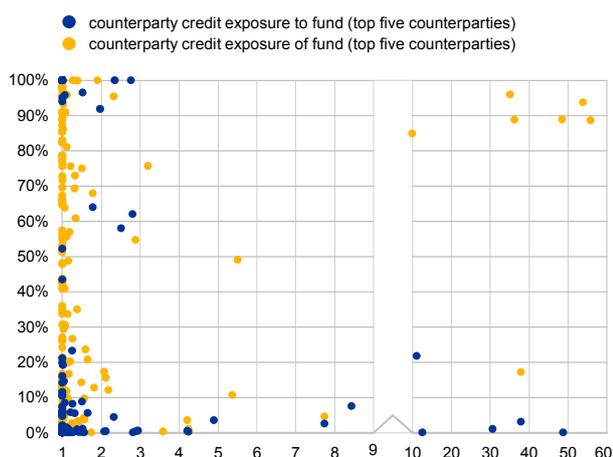
**Next, the framework aims to capture direct interconnections with financial institutions – a second channel for systemic risk.** The use of leverage can increase the risk of a fund encountering financial distress, which could be transmitted to the fund's counterparties and then to the broader financial system. To capture this risk, the framework first includes a measure for concentration in counterparty exposures to the fund. The blue scatters in Chart A.7 suggest that such counterparty concentration is overall low for the most leveraged funds. Second, funds can also have direct linkages with financial institutions via the fund's investor base and its investments. Chart A.8 shows that some substantially leveraged funds have a high share of financial institutions in their investor base, while their portfolio investments are not particularly concentrated in financial institutions.

**Chart A.7**

Some substantially leveraged AIFs have concentrated exposures to counterparties, but not vice versa

**Leverage and concentration of net counterparty credit exposure to/of the AIF**

(y-axis: total exposure to/of top five counterparties as a percentage of net asset value; x-axis: maximum of financial leverage and net financial and synthetic leverage reported under the commitment method, 1 = no leverage)



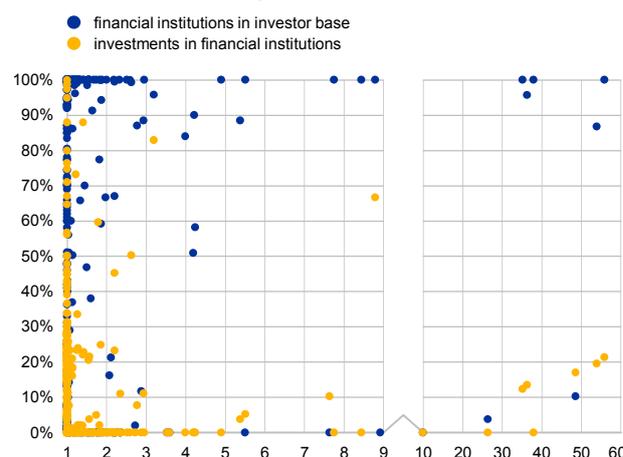
Source: DNB.

**Chart A.8**

Some substantially leveraged AIFs have a high share of financial investors, but no concentrated investments in financial institutions

**Leverage, share of financial institutions in investor base, and share of investments in financial institutions**

(y-axis: share of investor base composed of financial institutions, and share of investments in financial institutions as a percentage of net asset value; x-axis: maximum of financial leverage and net financial and synthetic leverage reported under the commitment method, 1 = no leverage)



Source: DNB. Note: The indicator for "financial institutions in investor base" excludes the exclusive funds on joint account of pension administration organisations.

**Finally, the framework aims to capture the potential for leveraged funds to contribute to systemic risk via the credit intermediation channel.** The use of leverage by funds could contribute to excessive credit intermediation and to the risk

of interruptions in the credit intermediation process when the cycle turns. Systemic risks could arise due to sudden stops in providing liquidity and short-term funding to financial institutions, sudden reductions in market liquidity for financial instruments that are important to credit intermediation, and insufficient risk separation.<sup>112</sup> Overall, leveraged AIFs in this sample of AIFs managed by asset managers based in the Netherlands have small direct investments in corporate bonds, limited investments in structured and securitised products, and do not sell credit risk protection.

## Design and calibration options for macroprudential leverage limits

**This section discusses design and calibration options for leverage limits, with a view to operationalising Article 25 of the AIFMD.** Article 25 allows the restriction of leverage if it is contributing to the “build-up of systemic risk in the financial system” or “risks of disorderly markets”. Limits can thus be applied to individual funds, a group(s) of funds, or the sector as a whole. The options discussed here focus on cross-sectional aspects, leaving time-varying aspects for future work.

**From a supervisory perspective, rules limiting investment fund leverage should be simple and transparent to ensure effective implementation.** Leverage should be defined in a consistent manner across types of institutions in order to avoid leakages and regulatory arbitrage. Taking note of the complexities in measuring leverage, the proposed limits should ideally build on existing concepts and definitions such as those already applied using the commitment approach for reporting leverage under the AIFMD, i.e. taking into account both financial and synthetic leverage.<sup>113</sup> A further backstop to prevent excessive use of derivative-based leverage should also be considered using the gross exposure method.

**The diversity of business models and corresponding risks may require a more differentiated approach when restricting leverage among AIFs.** There is a trade-off between simple rules and rules that account for the heterogeneity of business models. This requires a careful weighing of macroprudential objectives against the sector’s ability to provide valuable services to its clients which benefit the economy. With a view to striking the right balance between simplicity and flexibility, at least three possible approaches should be considered, ranging from a very simple (but less risk-sensitive) approach to a more risk-based (but more complex) approach.

**One option is to restrict leverage using a uniform standard across the sector.**

The advantage of such a one-size-fits-all approach would be that the rules could not be easily gamed and that all AIFs could be held accountable based on a uniform standard for the sector. A uniform rule, however, would not be able to differentiate between business models and would not be sensitive to other cross-sectional risk factors. Also, a uniform limit that would be binding for the most highly leveraged

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<sup>112</sup> Bengtsson, E., “Investment funds, shadow banking and systemic risk”, *Journal of Financial Regulation and Compliance*, Vol. 24(1), pp. 60-73.

<sup>113</sup> Notably, the Basel III leverage ratio allows for some netting of derivatives and therefore shares some similarities with the commitment method in the AIFMD.

funds may not be suited to preventing the build-up of leverage in the broader sector. With a lower limit, some business models may no longer be viable.

**Table A.1**

**Benchmarking by fund type: relative risk of contributing to a build-up of leverage-related systemic risks**

**Statistical comparison of the distribution of risk characteristics between a fund type and the rest of the AIF sector**

To test whether funds of a certain type tend to outperform or underperform the rest of the sample on the basis of a given indicator, the Mann-Whitney U-test, testing whether a particular population tends to have larger values than the other, is applied. As an additional safeguard against heterogeneity of the indicator values, a "tail rule test" is applied in a second step. The practical application is that where the Mann-Whitney U-test concludes that a certain type of fund generally outperforms or underperforms the rest of the population but more than 15% of the funds have indicator values in the opposite quartile of the distribution (i.e. contradicting the general trend), the Mann-Whitney U-test result is not considered sufficiently reliable, as the underlying indicator values are deemed to be too heterogeneous.

		Lower	Neutral	Higher	Too heterogeneous										
						Hedge funds	Bond funds	Equity funds	Mixed funds	Funds -of- funds	Private equity funds	Real estate funds	Infra-structure funds	Commo-dity funds	Other funds
<b>1. Use of leverage</b>	Financial leverage					Higher	Lower			Lower	Higher				Lower
	Net financial and synthetic leverage					Higher	Higher	Lower	Higher	Lower	Higher				
	Gross to net leverage						Higher			Lower				Too heterogeneous	Lower
<b>2. Risk of fire sales</b>	<b>Redemption profile</b>	Redemption frequency				Lower	Higher	Higher		Higher	Lower	Lower	Higher	Higher	Higher
		Investor concentration						Too heterogeneous	Higher	Too heterogeneous	Lower	Lower			
	<b>Liquidity profile</b>	Perceived portfolio liquidity					Lower	Lower	Lower	Lower	Higher	Higher			Lower
		Cash buffer					Lower		Higher	Higher					Lower
	<b>Counterparty concentration</b>	Counterparty credit exposure of fund					Higher	Too heterogeneous	Lower	Too heterogeneous	Higher		Higher		
<b>3. Risk of direct spillovers to financial institutions</b>	Counterparty credit exposure to fund										Higher				
	Investments in financial institutions					Higher	Higher	Higher	Higher	Lower	Lower				Lower
	Financial institutions in investor base						Higher	Higher		Lower		Higher	Higher	Higher	
<b>4. Risk of interruption in credit intermediation</b>	Investments in corporate bonds & loans						Higher	Lower	Higher		Lower	Higher			Higher
	Investments in structured & securitised products														Too heterogeneous

Source: DNB.

**Another option would be to have different limits depending on the fund type and/or risk characteristics.** AIFs would be classified based on their fund type (see Table A.1<sup>114</sup>). In addition, leverage limits could be further differentiated using the risk characteristics as presented in the framework. For instance, different limits could be applied depending on the redemption frequency, so funds with daily redemptions would face stricter leverage limits than funds with longer redemption frequencies. Such an approach would take into account the leverage and risk profiles of different business models or individual funds. However, clear criteria for differentiating

<sup>114</sup> The methodology applied is similar to the one that the European Banking Authority (EBA) applied to assess potential differences in the exposure to the risk of excessive leverage across different types of credit institutions, with a view to differentiating prudential leverage ratio level requirements. See *Report on the leverage ratio requirements under article 511 of the CRR*, EBA, August 2016.

between fund-specific characteristics would have to be devised. Furthermore, cliff effects may provide incentives for funds to obtain a more favourable classification.

**A third option would be to have different limits based on a comprehensive scoring model.** The scoring model would aggregate the scores of the indicators in the framework. Leverage limits would then be determined by the total risk score based on individual fund contributions as well as sector and market-wide risk characteristics. Such a scoring would capture a fund's critical role in certain markets and the system as a whole. This would help align the fund managers' incentives with the macroprudential supervisor's objectives to an even greater extent than under the previous two options. However, the implementation and calibration of such a framework can become very complex, especially if applied in a time-varying manner.

### The way forward: the need for an EU-level framework

**This joint ECB-DNB special feature offers a further step towards an EU-level framework for calibrating macroprudential leverage limits for AIFs.**

Operationalising macroprudential leverage limits under the AIFMD is one of the key short-to-medium-term tasks identified in the recently published ESRB strategy paper on macroprudential policy beyond banking. We aim to contribute to this goal by showing how the supervisory information collected under the AIFMD could be used to build an EU-level framework to guide the design and calibration of macroprudential leverage limits. Based on such a framework, we have also discussed three general approaches to design limits, focusing on cross-sectional aspects. Future work should consider the time-varying dimension of limiting AIF leverage.

**Close cooperation between national and EU competent authorities within the ESRB can take this work further.** An important next step would be to aggregate the national data needed to build an EU-level framework, so that these data can be analysed by the ESRB and its members. In this regard, the framework suggested in this special feature could serve as initial guidance on the specific information that should be extracted from the rich data collected on AIFs. Importantly, such a collective analysis could also contribute to identifying any further harmonisation needs for key indicators. Resolving any data issues, not least related to funds' reporting on their use of leverage, is essential if the goal of operationalising macroprudential leverage limits for AIFs at the EU level is to be attained.