

# Liquidity & Risk Management: Results of a Survey of Large Irish-Domiciled Funds

by Pierce Daly and Kitty Moloney<sup>1</sup>

## Abstract

This article examines the liquidity and risk management practices of large Irish-domiciled bond, mixed and money market funds. These funds are an important part of the credit intermediation chain. The 2008 crisis highlights the role of this sector as a transmission mechanism for systemic risk. Consequently, liquidity remains a concern for Central Banks and regulators. We find some evidence that regulation has reduced market liquidity. Considering run-risk, we highlight that large funds generally consist of institutional investors, not retail, and offer daily redemptions. We also analyse the types of liquidity management tools implemented, and find those used are pre-emptive in nature.

<sup>1</sup> The views expressed in this article are those of the authors and do not necessarily reflect those of the Central Bank of Ireland or the Eurosystem. The authors would like to thank Philip Lane, Gabriel Fagan, Naoise Metadger, Oisín Kenny, Jim Leen, David McCabe, Evin O'Reilly, Joe McNeill, Eduardo Maqui and Cian Murphy for comments on earlier drafts.

## 1. Introduction

In this paper, we present a survey of liquidity in large Irish-domiciled bond, mixed and money market funds. According to ECB data, Ireland represents 41 per cent of money market fund (MMF) total euro area assets and 17 per cent of investment fund (IF) assets as at end-2016.<sup>2</sup> MMFs, mixed and bond funds are an integral activity within credit intermediation. The 2008 crisis illustrates that large redemption requests in funds coupled with insufficient liquidity can lead to a fire sales of assets, increased risk premia and reduced supply of market-based finance (this can affect banks and sovereigns). This contagion channel increases the impact on the real economy as it amplifies the effects of a financial crisis (Ansidei, et al., 2012). In the case of Ireland, there is limited concern for domestic financial stability as funds' exposures are mainly international (Central Bank of Ireland, 2017a). Financial stability concerns mainly relate to the sector's exposure to the global financial system.

Recent research highlights an increase in the weighted average life of debt portfolios of bond, mixed and other fund categories over recent quarters (Central Bank of Ireland, 2017a, ESRB, 2017). Maturity transformation occurs when long-term assets are financed by short-term liabilities. This maturity mismatch may lead to redemption runs on investment funds. Equally, liquidity transformation/mismatch between assets and liabilities can also lead to runs and financial instability.

Since the crisis, there has been an increasing emphasis by regulators and central banks on the monitoring and analysis of liquidity and liquidity practices within funds. The International Monetary Fund (IMF), the Financial Stability Board (FSB), the European Systemic Risk Board (ESRB) and the European Securities and Markets Authority (ESMA) amongst others have begun to assess the need for and the potential design of regulatory liquidity stress tests in this sector. Many

challenges are inherent to this analysis. Is regulation affecting liquidity? What are the most useful models and tools to use when analysing liquidity? How do we define liquidity? And how do we recreate the dynamics of a financial crisis?

This paper informs this research by presenting reported levels of liquidity within a sample of large Irish-domiciled funds as well as presenting industry liquidity-management tools and practices. Many regulators do not have security-level data for this sector so this paper gives examples of what type of securities funds are investing in and to what extent. It also highlights some of the practices that are used to manage that liquidity, for example stress test models and liquidity management tools.

We present new data based on Irish submissions to an ESRB survey on liquidity and liquidity practices.<sup>3</sup> The survey focuses on European bond, mixed and money market funds with a large (greater than €500m) total Net Asset Value (NAV) as of Q2 2015.<sup>4</sup> In this survey asset managers were asked specifically about the liquidity of their portfolios, the ways in which they assess liquidity risks and how they manage large redemption requests. The survey also asks for their views on the aggregate levels of liquidity in the market and the impact of regulatory changes.

The remainder of the paper is structured as follows: Section 2 reviews previous research and market intelligence. The core methodology of the questionnaire and the data analysis process are outlined in Section 3. Section 4 presents the results of the questionnaire. This is split into two subsections: a qualitative section and a quantitative section. Section 5 provides the key conclusions and recommendations for future work.

<sup>2</sup> See ECB Statistical Data Warehouse for the balance sheet statistics of MMFs here: <http://sdw.ecb.europa.eu/browse.do?node=9691317>; and IFs (all investment funds excluding MMFs) here: <http://sdw.ecb.europa.eu/browse.do?node=9691348>.

<sup>3</sup> In total, asset managers from six jurisdictions (Ireland, France, Luxembourg, Germany, Italy and the United Kingdom) took part in the questionnaire.

<sup>4</sup> Data on asset holdings and liquidity is requested and reported as a value (euro) of "total fund assets" rather than NAV; as such, this paper refers to AUM throughout.

## 2. Regulatory perspective and previous research

As highlighted in the introduction, the 2008 crisis exposed significant vulnerabilities in the funds sector. For example, directly after Lehman's collapse in September 2008, the Reserve Primary Money Market Fund "broke the buck" i.e. became technically insolvent. This led to large-scale redemptions of MMFs, which in turn lead to forced asset sales, increased risk premia and dysfunctional markets. One of the markets affected was bank credit (Dwyer & Tkac, 2009). Funding became more limited and expensive, thereby amplifying the crisis.

Since then a number of international standard setters have highlighted the interlinkages between IFs and MMFs and other sectors of the economy as a potential threat to financial stability. The FSB (2017a) highlights that potential triggers of instability include liquidity and maturity mismatch and high leverage.

A number of principles and regulations have been put in place to guide asset managers on liquidity management practices. The International Organisation of Securities Commissions (IOSCO) advise that a fund manager should be able to demonstrate that effective and appropriate liquidity risk management policies and procedures are in place (IOSCO, 2015). In accordance with the Undertakings for Collective Investment in Transferable Securities (UCITS) Directive and Alternative Investment Fund Managers (AIFM) Directive, funds must (where appropriate) conduct stress tests, in addition to implementing risk management procedures and risk limits.<sup>5</sup> In particular, the liquidity assessment of the fund should take into account factors such as trading frequency, number of transactions, volume, availability at certain market prices, and whether selling affects the market.

Looking at specific jurisdictions, the Ontario Securities Commission (OSC) assessed the risk management procedures and portfolio

liquidity of mutual funds in Canada (OSC, 2015). Furthermore, Ramirez, Sierra Jimenez & Witmer (2015) noted the potential risks to the Canadian economy as a result of a growing investment funds industry. Such analyses have allowed national regulators and supervisors to improve both their understanding of the sector and the potential policy responses.

Research by the French Asset Management Association (AFG) emphasise that requirements for performing stress tests remain varied and imprecise, and note the lack of transparency in the details of stress test techniques (AFG, 2015). Likewise, in Ireland, industry bilateral meetings between the Central Bank and investment managers find no current standard, market-wide methodology to monitor and manage liquidity risk.

The recent International Monetary Fund (IMF) Financial Sector Assessment Program (2016) of the Irish financial system recommends increased monitoring of liquidity risk in MMFs and IFs. The IMF also recommend the development of frequent stress testing of MMFs and IFs, and the analysis of investor profiles. Previous research on investor characteristics (whether investors are retail or institutional) has shown that profile can influence redemption pressures under stressed market conditions. For example, Li, Tiwari & Tong (2016) find that when higher ambiguity exists regarding fund performance measures, retail investors are more sensitive to performance than institutional investors. Chen, Goldstein & Jiang (2010) also note that retail investors in illiquid funds exhibit a stronger sensitivity of outflows to bad past performance than those in liquid funds.

Investors may also be subject to 'first mover advantage' (FSB, 2017b). That is, under stressed conditions there may be incentives for investors to redeem early to avoid any readjustment in the value of a fund's assets due to heightened illiquidity. Consequently, written redemption policies and the availability of (both ongoing and exceptional) liquidity risk management practices and tools are

<sup>5</sup> See Directive 2011/61/EU of the European Parliament and of the Council on Alternative Investment Fund Managers and amending Directives 2003/41/EC and 2009/65/EC and Regulations (EC) No 1060/2009 and (EU) No 1095/2010 (AIFMD) [2011] OJ L 174, arts 15-16; and Commission Directive 2010/43/EU implementing Directive 2009/65/EC (UCITS) of the European Parliament and of the Council as regards organisational requirements, conflicts of interest, conduct of business, risk management and content of the agreement between a depositary and a management company [2010] OJ L 176, arts 38-45.

encouraged by regulators to reduce this early redemption incentive.

Looking specifically at liquidity management tools, IOSCO find that all major liquidity management tools are available to Irish domiciled UCITS and AIFs (IOSCO, 2015, p. 15). These include side pockets, redemption fees, anti-dilution levies, redemption gates, redemptions in kind and suspension of redemptions (see Chart 5 for definitions). One limitation of the questionnaire is that evidence regarding tool effectiveness was not requested. Cipriani et al. (2014) suggest that the existence of gates and fees may actually cause a pre-emptive run rather than prevent one.

European authorities such as the ESRB (2017) and ESMA (2017) are also actively engaging in the review of risks in this sector and the analysis of stress testing techniques. The role of many of these variables are referred to in the ESRB questionnaire responses herewith and give empirical evidence of the implementation of the IOSCO recommendations.

### 3. Data overview and cleaning

#### 3.1 Overview of Questionnaire Data

In this section, we provide an overview of the data collected for Irish-domiciled investment and money market funds as part of the ESRB questionnaire.<sup>6</sup> Answers are populated as of the 30 June 2015. The requests went to asset managers of at least one Irish domiciled investment fund that:

- (a) Is authorised under Directive 2014/91/EU of the European Parliament and of the Council (UCITS Directive) or Directive 2011/61/EU of the European Parliament and of the Council (AIFM Directive);
- (b) Is authorised for distribution in the Union;
- (c) Is an open-ended bond fund, mixed fund or money market fund;

- (d) Holds net assets of €500 million or more as of 30 June 2015.

For the purpose of analysis, we have divided the results of the questionnaire into qualitative and quantitative subsections as follows:

#### Qualitative section:

- Liquidity risk management policies and practices
- Risk profile and liquidity buffers
- Market trends, disruptions and regulation
- Current liquidity stress testing practices

#### Quantitative section:

- Descriptive Statistics
- Asset holdings
- Funds of funds
- Asset liquidity
- Investor concentration
- Redemption policy
- Liquidity management tools

The total data sample consists of responses from 72 asset managers, representing 311 Irish-domiciled funds. The majority of the asset managers are located outside of Ireland. The main activities in Ireland are fund administration, fund management and depositary services. The reported assets under management (AUM) of the raw sample amount to €772bn as of 30 June 2015. MMFs are the largest subgroup with €348.6bn in AUM, followed by bond funds (€341.5bn) and mixed funds (€66bn). We suggest that the sample is representative of large funds rather than all funds. This is particularly so when looking at the mixed fund results.

#### 3.2 Data Cleaning

Prior to the analysis of the survey responses, the data is subject to a rigorous cleaning process. Funds which report a Net Asset Value (NAV) below the questionnaires €500m threshold are omitted. Using the Central Bank of Ireland's regulatory Investment Fund (MMIF) and Money Market Fund (MMM) Returns, the reported AUM of funds in the questionnaire are validated, and where inconsistencies arise, data is omitted.<sup>7</sup> Moreover, we reduce our sample

<sup>6</sup> We note that in this paper "funds" refers to stand-alone funds and sub-funds of umbrellas.

<sup>7</sup> MMIF and MMM return data is collected by the Statistics Division at the Central Bank of Ireland on a quarterly and monthly basis respectively, to fulfil ECB reporting requirements (Central Bank of Ireland, 2017b, 2017c).

**Table 1: Final Sample Sizes**

Section	Asset Managers
Qualitative Section	Asset Managers
Liquidity Risk Management Policies & Practices	72
Risk Profile & Liquidity Buffers	72
Market Trends, Disruptions & Regulation	72
Current Liquidity Stress Testing Practices	67
Quantitative Section	Investment Funds
Descriptive Statistics	153
Asset Holdings	153
Funds of funds	61
Investor Concentration	243
Redemption Policy	225
Liquidity Management Tools	283

**Source:** Central Bank of Ireland, ESRB.

where questionnaire submissions are only partially completed. To maximise the use of available data, for any given fund, we only omit data for incorrectly completed subsections of the questionnaire, while including correctly completed data for other subsections.

Applying the above cleaning methods, we obtain a varying sample size for subsections in the analysis. Table 1 summarises the post-cleaning sample sizes.

## 4. Results

### 4.1 Qualitative results

The following subsections reflect responses provided by the asset managers of the total fund sample. The responses given by asset managers refer in general to all the funds they manage. The qualitative section of the paper highlights models, tools and techniques currently available to industry and is particularly useful to central bankers and regulators looking to develop liquidity stress tests for this sector. It also provides a description of industry's views on market liquidity and the impact of regulation.

#### 4.1.1 Liquidity risk management policies and practices

All responding asset managers confirm that defined liquidity policies and procedures are in place in their sub-funds. These practices are ex-ante and on-going and can act as a buffer to the build-up, and impact of risk. In general, we note risk limits require monthly review/ approval by the company's chief investment officer or manager or board of directors, and in some cases internal audit.

To ensure that a fund does not exceed specific risk limits, pre and post-trade monitoring is employed. Pre-trade monitoring is designed to prevent the portfolio manager or trader entering ineligible trades (beyond a fund's investment limits for specific asset classes or illiquid assets). Likewise, post-trade monitoring of trades highlights where risk limits or policies are breached. The majority of funds have a predefined escalation process.

In the event of a breach, a validation of its occurrence and severity are performed by a risk management team/portfolio management team/compliance department. This is subsequently reported to the portfolio manager or dedicated internal risk committee (consisting of senior management) and board of directors. The fund undertakes immediate action to correct the breach.

For most of the respondents (94 per cent), formal contingency plans are present for periods of severe illiquidity. Liquidity management tools and credit lines are also available but generally not required.<sup>8</sup>

#### 4.1.2 Risk profile and liquidity buffers

Respondents generally state that should the risk profile of the fund change, the redemption policy and liquidity management tools may be adjusted in accordance with its prospectus, necessary regulation, board approval and/or shareholder vote. Moreover, we find that the main factors determining fund-exposure limits to different assets include regulatory requirements, investment objectives, intended risk profile and rating agency practice. The majority of respondents state they regularly review limits, although review periods vary from manager to manager.

A fund's investment objectives and associated investment guidelines can set a general framework for a sufficient cash or liquidity buffer. The size of these buffers tends to be determined by market liquidity and/or the potential risk of significant redemptions. Approximately 50 per cent of asset managers report that their funds have no strict predefined approach to liquidity or cash buffers. According to asset managers, this is due to the liquid nature of their portfolios. The remaining asset managers specify they either take a dynamic approach to buffers (i.e. they may be increased during stressed market conditions) or a minority have strictly defined limits.

In general, when setting buffers, asset managers are balancing the trade-off between maintaining sufficient liquidity and maximising fund performance. Many view larger than normal cash balances as an opportunity to exploit potential market dislocations. Moreover, funds may need to satisfy certain regulatory and credit rating requirements (for example,

to achieve an AAA credit rating, MMFs must satisfy certain liquidity requirements).<sup>9</sup> A minority of managers report that their funds increased buffers since 2008 or in response to increased market volatility.<sup>10</sup> The majority of asset managers report no amendments to their liquidity and cash buffer strategy in response to recent trends in market liquidity.

#### 4.1.3 Market trends, disruptions and regulation

There is some evidence of increased market illiquidity and volatility since the crisis. Approximately 50 per cent of asset managers report that they have witnessed no decline in market liquidity in recent years, while the remaining 50 per cent state they have seen either market-specific or a general decline in market liquidity. Many asset managers indicate liquidity fell from 2006 onwards and stabilised in 2012, albeit at a materially lower level.

Individual asset managers report declining market liquidity since the financial crisis in some and/or all of the EU markets highlighted in the questionnaire. That is asset backed securities (ABS), covered bonds, investment grade corporate bonds, high yield corporate bonds and sovereign bonds. Across these asset classes, asset managers note declines in overall trading volumes, the number of daily transactions, average transaction size and an increase in bid-ask spreads. Likewise, asset managers report a reduction in large-volume traders, decrease in the number of market-makers and highlight the need to split transactions between several counterparties. Looking at sovereign bonds, a number of asset managers also note diverging liquidity in the bonds of different EU member states.

A small number of asset managers indicate that declines in liquidity and increases in volatility have somewhat affected portfolio construction.<sup>11</sup> In the case of both hypothetical

<sup>8</sup> Credit lines can include subordinated loans from a parent company or a custodian overdraft. A custodian overdraft is not a guaranteed credit line; this is at the discretion of the custodian and is short-term only.

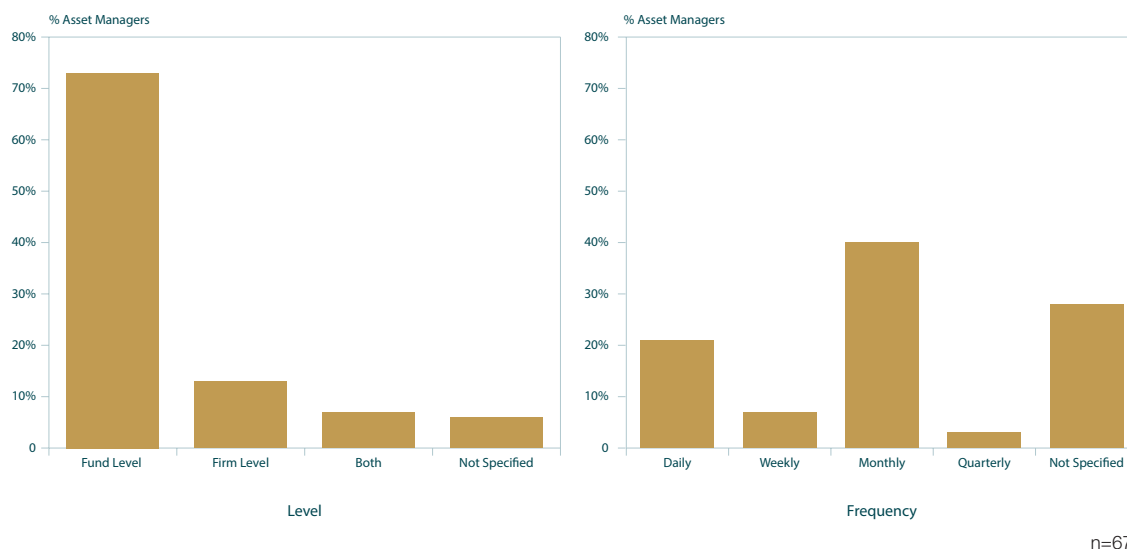
<sup>9</sup> As one asset manager states, in the case of Moody's, at least 20 per cent of the NAV must be held in overnight instruments, reverse repo and unsecured deposits. Funds must hold overnight assets such that it satisfies a minimum 76 per cent of the amount invested by the top 3 investors.

<sup>10</sup> For example, since the financial market collapse in 2008, one asset manager notes its sub funds cash buffers have been increased from 5 to 15 per cent. However, there has been no requirement to further increase these buffers. For another manager, adjustments involved an increase in cash exposure for one of its funds to 10 per cent, because of high yield market.

<sup>11</sup> Of these, one asset manager noted their funds attempt to mitigate increased volatility by working in partnership with counterparties to source liquidity and achieve as tight bid/offer spreads as possible. Another rewrote liquidity risk controls for their MMFs.



Chart 1: Stress Testing: Level &amp; Frequency



Source: Central Bank of Ireland, ESRB.

Note: 'Not specified' refers to those funds which do not provide details of the level or frequency of stress testing.

and observed disruptions, asset managers state that they reduce exposure in asset classes that experience amplified stress. They will also increase cash balances and diversify the portfolio composition.

Only one respondent states they have been forced to withdraw from specific market activities since the crisis. They report "soft closing" one of their funds following a reduction in liquidity and also withdrawing from the commercial paper (CP) market. Soft closing is a process by which an open-ended fund ceases to accept money from new investors; however, existing shareholders can still buy shares of the fund.

According to a number of asset managers, regulations such as Solvency II and Capital Requirements Regulation/ Capital Requirements Directive IV (which impose tougher capital requirements on insurance companies and banks) have affected the risk appetite of such financial institutions, reducing the amount of capital available to commit to trading, thereby reducing market liquidity.<sup>12</sup> For example, one respondent states the reduced liquidity/capital provided by investment banks was a catalyst for the cessation of one of their funds (not included in the questionnaire).

Another asset manager outlines that recent regulatory changes have seen a reduction in liquidity in overnight reverse repos and short-term credit default swaps (CDS). As a result, they have replaced these with government T-Bills and other short-term investments. Thus, there is some evidence that regulatory change has reduced market liquidity.

#### 4.1.4 Current liquidity stress testing practices

Stress testing of funds based on historical and hypothetical scenarios is important to analyse a funds capacity to deal with large-scale redemption shocks. Chart 1 presents details on the level and frequency of stress testing as provided in the survey.

We find that 73 per cent of asset managers report stress tests are performed per fund portfolio (fund level), 13 per cent conduct tests for the fund manager as a whole (firm level), and 7 per cent at both levels. The most common frequency of stress testing is monthly (40 per cent). Over 50 per cent of asset managers also specify that they undertake ad-hoc stress tests in response to changes in market conditions and redemption pressures.

<sup>12</sup> Directive 2009/138/EC of the European Parliament and of the Council of 25 November 2009 on the taking-up and pursuit of the business of Insurance and Reinsurance (Solvency II) [2009] OJ L 335, 17.12.2009; and Regulation 2013/575/EU on prudential requirements for credit institutions and investment firms and amending Regulation (EU) No. 648/2012 [2013] OJ L 176, 27.6.2013.

**Table 2: AUM, Mean, Median & Standard Deviation**

Fund Type	n	AUM	% Total Pop. AUM*	Sample Mean	Sample Median	Sample Standard Deviation	Sample Std. dev. as % Median
Mixed	24	€34.2bn	15%	€1.4bn	€0.9bn	1.1bn	122%
Bond	98	€145.8bn	22%	€1.5bn	€1.1bn	1.1bn	100%
MMF	31	€242.6bn	52%	€7.8bn	€3.1bn	9.9bn	319%
All funds	153	€422.5bn	31%	€2.8bn	€1.2bn	5.2bn	433%

\*: % of Total Pop. AUM refers to the sample size as a percentage of the total Irish funds' population AUM for this category of funds. This outlines the representativeness of the sample for the total Irish funds sector.

In general, the design of stress tests varies. A combination of normal and stressed scenarios (historical and hypothetical) are applied to stress liquidity risk. The scenarios include increased interest rate and credit spreads, enlarged redemptions, displacement of liquidity to a higher bucket and downgrading of the largest issuers. The tests integrate key market events and the external environment (emerging markets behaviour) into their assessment.

Models applied include Value at Risk (VaR), a Liquidity Cost Score (LCS)<sup>13</sup>, Monte Carlo simulations for scenario analysis at a macro or security level, covariance matrices with sigma shocks<sup>14</sup>, and a wide range of third party instruments (including matrices determined by credit rating agencies and generic price impact functions). These results concur with the AFG when they suggest that the methods and instruments used in stress testing of funds vary substantially from one asset manager to another (AFG, 2015).

Stress tests are used as flags to influence limits or thresholds. In general, asset managers state that they use stress tests where vulnerabilities are discovered to review the funds risk profile and limits, and to influence the fund's investment decisions. Accordingly, stress tests are critical to determining the appetite for risk-taking in a fund.

#### 4.2 Quantitative results

The following subsections describe the asset holdings, liquidity, investor concentration, redemption policy and liquidity management tools of different fund categories. We analyse funds according to their reported fund category in the questionnaire. The criteria for classifying funds into such categories are derived from the public prospectus, fund rules, instruments of incorporation, established statutes or by-laws, subscription documents or investment contracts, marketing documents, or any other statement with similar effect. The definition of fund categories analysed in this article is as follows:

- **Bond funds:** these are funds primarily investing in securities other than shares.<sup>15</sup>
- **Mixed funds:** these are funds, which invest in both equity and bonds with no prevalent policy in favour of one or the other instrument.<sup>15</sup>
- **Money Market funds:** these are funds which invest primarily in money market fund shares/units, short-term debt securities and/or deposits.<sup>16</sup>

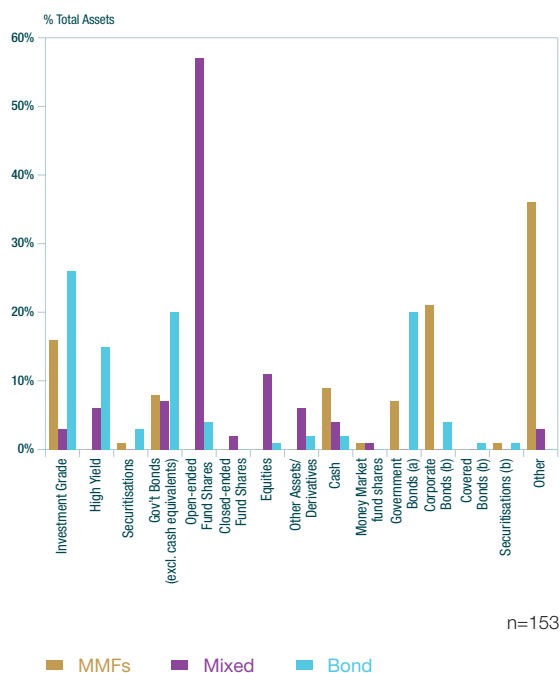
<sup>13</sup> LCS measures the cost of buying and selling a bond. It is computed at the instrument level and is based on the bid ask spread and the spread duration. It allows portfolio managers, traders and risk management a quantifiable measurement of liquidity at the security level that can then be aggregated into a comprehensive view of liquidity at the sector and portfolio levels.

<sup>14</sup> The degrees of the sigma shocks are informed by historical market volatility and losses resulting from events like the global financial crisis in 2008. The tests assume correlations between the different risk positions in the fund based generally on historical correlation levels. Strategies that allow for daily redemptions monitor their asset liquidity profiles.

<sup>15</sup> See MMIF guidance notes (Central Bank of Ireland, 2017C) for the definition of a Bond fund and a Mixed fund (see annex 2, page 66-67): [http://www.centralbank.ie/docs/default-source/statistics/statistical-reporting-requirements/fund-administrators/money-market-and-investment-funds-return-\(mmif\)/mmif-notes-on-compilation.pdf?sfvrsn=](http://www.centralbank.ie/docs/default-source/statistics/statistical-reporting-requirements/fund-administrators/money-market-and-investment-funds-return-(mmif)/mmif-notes-on-compilation.pdf?sfvrsn=)

<sup>16</sup> For a definition of MMFs see Regulation (EU) No. 1071/2013 of the European Central Bank concerning the balance sheet of the monetary financial institutions sector [2013] OJ L297, 7.11.2013, art 2.: <https://www.ecb.europa.eu/ecb/legal/pdf/02013r1071-20131127-en.pdf>



**Chart 2: Weighted Average Asset Portfolio Composition**

Source: Central Bank of Ireland, ESRB.

Note: weighted average as a percentage of AUM for each fund category. Respondents self report their fund category. Asset classes are defined in the ESRB Questionnaire as follows:

**Non-Cash Equivalents:**

**Cash** is defined as all deposits held at banks.

**Open-ended and closed-ended fund shares** exclude those held in MMFs. All other non-cash equivalent assets are not defined in the questionnaire, however are assumed to follow ratings criteria.

**Cash equivalents:**

**Money Market fund shares** refer to fund shares/units held in MMFs.

(a) All sovereign and sovereign-guaranteed debt of any remaining maturity rated Aa3/AA- or above by at least one of Moody's, S&P or Fitch or via an equivalent rating approach.

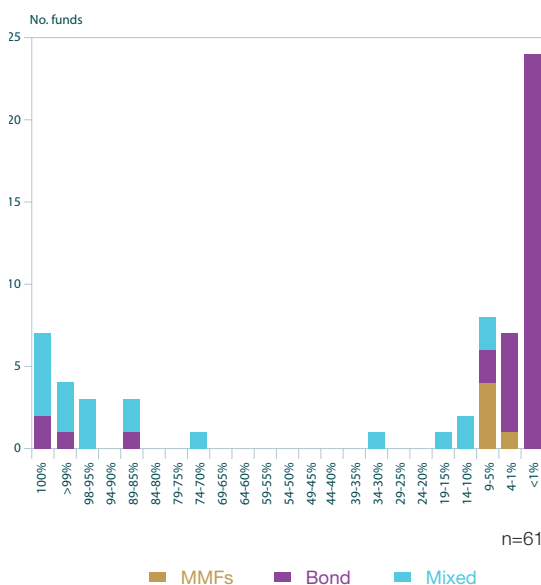
(b) Securities of any maturity rated Aa3/AA- or above by at least one of Moody's, S&P or Fitch or via an equivalent rating approach.

'Other' assets are not defined but are expected to include short-term repurchase agreements and money market securities.

#### 4.2.1 Descriptive Statistics

Table 2 outlines the descriptive statistics for each fund category. In terms of AUM, we find the largest group is MMFs followed by bond funds and then mixed funds. We note that the sample size for this section of the survey is considerably smaller than other sections (see Table 1). This is due to reporting errors in the sample, which were removed as part of the cleaning process.

We note in Table 2 that the sample size for this section of the survey has reduced and now represents 31 per cent of the total population AUM. MMFs remain the most representative, at 52 percent of the total population for this category followed by bond funds at 22 per cent and mixed funds at 15 per cent.

**Chart 3: Percentage of total assets held in other funds, by holding fund category**

Source: Central Bank of Ireland, ESRB.

In all cases, the mean is greater than the median indicating that we are looking at an asymmetrical distribution that is skewed to the right (due to a small number of funds with large AUM). Thus when describing funds, the median is a better indicator of the average fund AUM than the mean. We also note the spread around the median (the standard deviation) is largest in percentage terms for MMFs, followed by mixed funds and then bond funds. This suggests that there is more variability in MMF size than in the other two categories, with a small number of large AUM funds influencing descriptive statistics. In addition, we suggest using weighted average measures when analysing the average holdings of funds to remove the impact of larger funds on average figures. For example, the weighted average is calculated in Chart 2. This information should be useful to supervisors and analysts of the sector in ensuring benchmarks are representative.

#### 4.2.2 Asset Holdings

Chart 2 illustrates the varying asset holdings across fund types. Asset holdings are categorised into two groups based on their liquidity (cash and non-cash equivalent assets). On the chart, all assets to the right of cash are

cash equivalents. The distinction is based on ratings. Cash equivalents are defined by the ESRB as being assets rated Aa3/AA- or above. We note that this definition of liquid assets is quite broad. MMFs' top two holdings are "cash equivalent" corporate bonds and "other" cash equivalent securities. From looking at Central Bank data, we suggest the "other" cash equivalent securities are mainly short-term repurchase agreements and money market instruments. From a liquidity perspective, we suggest that the "cash equivalent" corporate bond holdings may suffer some liquidity constraints during a fire sale. For example, Basel III's High Quality Liquid Assets measure places a 15 per cent haircut on corporate debt equivalent to (b) in Chart 2 (BCBS, 2013). With respect to repurchase agreements and money market instruments, these are traditionally liquid. However, there may be longer maturity securities in here and we would caveat that further analysis is required. Overall MMFs report holding more liquid assets than bond funds and mixed funds.

Bond funds report investing in mainly cash-equivalent government bonds, non cash-equivalent government bonds and investment grade bonds. Mixed funds top constituents are open-ended fund shares and equities.

#### 4.2.3 Funds of Funds

Within the bond and mixed fund categories, we also identify 'Fund of Funds' (FoFs). 'Fund of Funds' is an investment strategy in which funds invests in other funds rather than investing directly in assets such as stocks, bonds or other debt securities. Within our 153 fund sample, we identify 61 entities who report holding fund shares. Of these, we find two categories of funds that invest in other IFs and MMFs. These present diverging investment strategies, that is fund of funds and funds with small holdings in other funds (particularly in MMFs). It appears that a minority of funds hold other funds shares and within that, a smaller cohort are funds of funds.

As illustrated in Chart 3, 17 funds (13 mixed and 4 bond funds) hold 85 per cent or more of their assets in other funds. The 17 funds hold 97.6 per cent of these assets in other open-ended IFs, 2.1 per cent in closed-ended IFs and 0.3 per cent in MMFs. Of these 17 entities we note 14 appear to be funds of funds with the remaining 3 identified as master/feeder funds.<sup>17</sup> We caveat this result by noting the small sample size; however, we suggest that this may be indicative of an overall pattern within the funds sector.

In contrast, funds which invest less than 15 per cent of their assets in other funds hold approximately 64 per cent of these assets in MMFs (which may be seen as cash equivalent investments (see Chart 2)) and 36 per cent in other open-ended IFs. Thus, we can see that a lack of liquidity in MMFs may have a knock-on effect on other funds which invest in MMFs as part of their liquidity strategy.

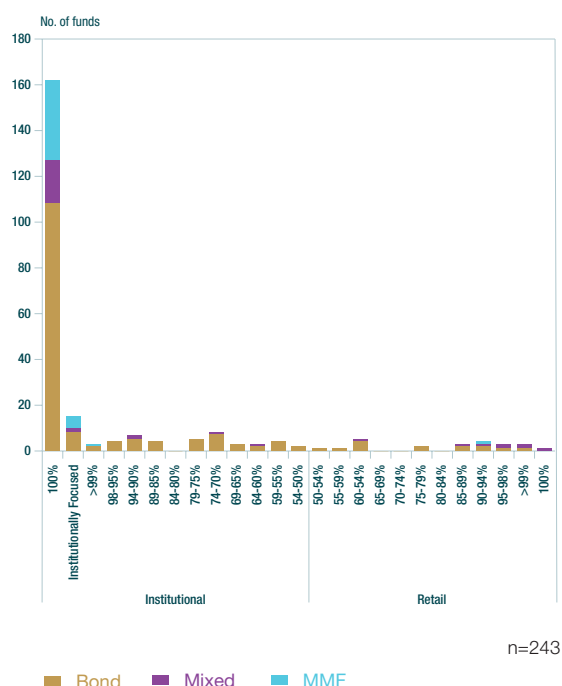
The characteristics of both groups are important in understanding potential channels of contagion under periods of market stress. The IMF note that cross shareholdings are important as redemption shocks in a fund of funds may transmit stress to other entities, due to the investment structure (IMF, 2016, p. 16).

#### 4.2.4 Asset Liquidity

Sufficient liquidity is essential to a fund's ability to meet redemption requests. As part of the survey, fund managers were requested to split their portfolios into liquidity buckets. The buckets represent how long it will take a fund to liquidate the portfolio. Liquidity buckets could be a useful tool for regulators in the assessment of liquidity (and stress testing) as they allow a quick review of the liquidity of the entity. Upon analysis of data reported in the questionnaire, we find the results do not align with the asset splits outlined in Chart 2. In addition, these do not align with liquidity buckets reported for the same entities to the Central Bank as part of MMM/MMIF reporting. Thus, we do not include the results in the

<sup>17</sup> Under the master-feeder fund structure investors place their money into feeder funds that then invests into a master fund. The master fund then invests directly in the market. The purpose of the feeder fund is to 'feed' investor funds into the master fund. The feeder fund then receives the flow of P&L, which is subsequently fed to its investors. See (ECB, 2009) below for more details (page 14):

<https://www.ecb.europa.eu/pub/pdf/other/manualinvestmentfundstatistics200905en.pdf>

**Chart 4: Investor Profile by Percentage Type and Fund Category**

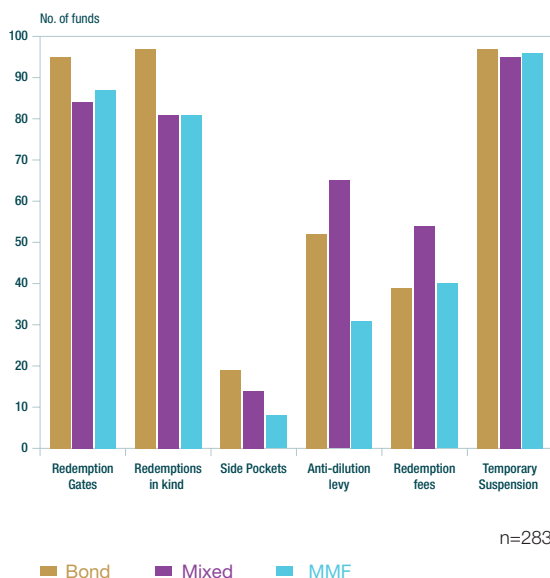
Source: Central Bank of Ireland, ESRB.

paper but note the inconsistency and suggest validation of liquidity buckets prior to their use by regulators or central banks.

#### 4.2.5 Investor Concentration

The investor profile of a fund is important in the consideration of appropriate levels of liquidity. As noted in Section 2, investors' profile can affect redemption outflows during stressed market conditions. In particular, recent research has shown that retail investors may exhibit stronger sensitivity towards fund performance and outflows than institutional investors. This research in part comes because of a much-held belief that most funds are held by retail investors. However, the results below illustrate that this is not the case for most large bond, mixed and MMFs. Chart 4 illustrates the reported investor concentration for 243 investment funds.

Analysis reveals that 91 per cent of funds report that more than half of their investors are institutional (including those funds that report they are institutionally focused). For

**Chart 5: Availability of Liquidity Management Tools**

Source: Central Bank of Ireland, ESRB.

#### Definitions as provided in ESRB Questionnaire:

- (a) Redemptions gates:** where redemption requests exceed a certain threshold, funds can decide to carry forward any redemption requests in excess of that threshold to the next dealing day.
- (b) Redemption in kind:** fund may decide to satisfy redemption requests by transferring securities, instead of cash, to the redeeming unit-holder.
- (c) Side pockets:** funds may place illiquid investments in a separate 'side pocket' and issue shares in the side pocket to unit-holders in the investment fund on a pro rata basis. This tool is only available to AIFs in Ireland (IOSCO, 2015).
- (d) Anti-dilution levy:** funds can charge an investor buying or selling units when the fund is in a net subscription or redemption position.
- (e) Redemption fees:** funds have the ability to charge a redemption fee in circumstances where it is experiencing large outflows.
- (f) Temporary suspension of dealings:** dealings in the fund can be temporarily suspended.

67 per cent of funds we find that institutional investors hold 100 per cent of fund units.<sup>18</sup> In contrast, we find that in only 9.5 per cent of funds do retail investors hold more than 50 per cent of units. Moreover, in only 1 fund (0.4 per cent) do we find that retail investors hold 100 per cent of units. While the majority of funds report their investor concentration is largely institutional, we note data is only available on a first counterparty basis, and it is not possible to distinguish the ultimate beneficial owner (which may be retail). Further analysis of the redemption patterns of funds may be a useful validation of these results.

#### 4.2.6 Redemption Policy

A fund's redemption policy is the frequency at which a fund allows redemptions or subscriptions to take place. This may impact upon liquidity risk under stressed market

<sup>18</sup> Institutional investors are entities such as banks, insurance companies and investment funds that pool the funds of their members to purchase a range of assets. Alternatively, funds can consist of retail investors (individual investors).

**Table 3: Redemption Policy (Percentage of Funds)**

Redemption Policy	Bond funds (n=155)	Mixed funds (n=28)	MMFs (n=42)	All funds (n=225)
Investors can redeem daily	92.0%	92.9%	100%	93.3%
Investors can redeem within 7 days	2.6%	3.6%	0%	2.2%
Investors can redeem within 8-14 days	0.6%	0.0%	0%	0.4%
Investors can redeem within 15 or more days	5.2%	3.6%	0%	4.0%

Source: Central Bank of Ireland, ESRB.

conditions. Table 3 describes the redemption policy reported by fund category for 225 responding entities.

Of the above sample, 93 per cent of funds report a daily redemption policy. As expected MMFs have the largest proportion of daily redemptions of the three categories (100 per cent).<sup>19</sup> This would be an important characteristic when designing a stress test as most funds have daily redemptions. It also speaks to the potential for liquidity transformation in funds.

#### 4.2.7 Liquidity Management Tools

Similar to insights regarding redemption policy, we suggest that liquidity management tools should be considered for inclusion in the design of fund stress tests. Chart 5 illustrates the availability of liquidity management tools for 283 funds in our sample.<sup>20</sup>

We find that redemption gates, redemptions in kind and temporary suspensions are the most commonly available tools. Bond funds report the highest availability of redemptions in kind, redemption gates, side pockets and suspension of redemptions. Redemption fees and anti-dilution levies (ADLs) are most commonly available in mixed funds (54 per cent and 65 per cent respectively).

The above six tools are ex-post in nature as they are used ‘after an event’. An anti-dilution

levy or redemption fee may also be deemed ex-ante, or pre-emptive, as it may be used under normal circumstances in Ireland, i.e. ‘before an event’.

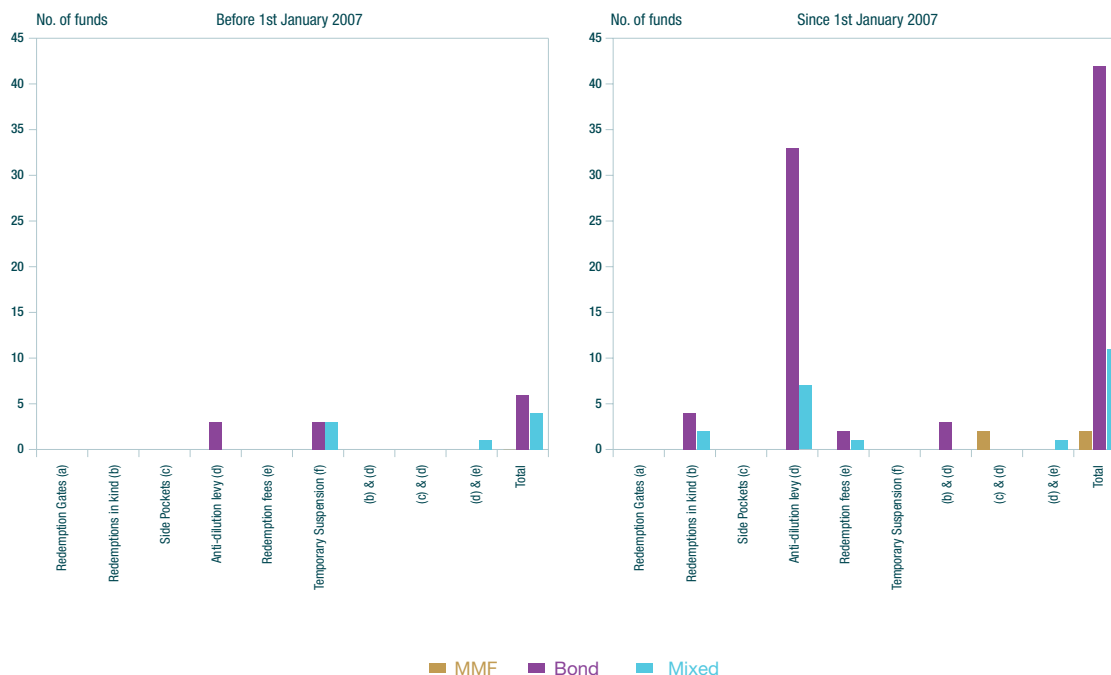
Chart 5 illustrates what is available but it does not illustrate whether these tools are used. Chart 6 illustrates the tools which funds report they have applied during two time periods: (a) prior to 1 January 2007 and (b) from 1 January 2007 to 30 June 2015. Approximately 4 per cent of funds (10 funds) use liquidity management tools during the first period with 19 per cent (55 funds) doing so in the latter period. We note that liquidity management tools are used most commonly by bond funds, then mixed funds with only 2 MMFs using tools in the second period. These tools are still only used in a minority of cases. This is possibly because funds have no need to use these tools as they can manage liquidity and also because the use of these tools may damage the fund’s reputation and franchise value (RISK, 2016). In addition, the use of tools could also act as a negative signal to investors, leading to further redemption pressure on a fund.

We find that the most commonly used tool is an ADL. These tools are generally pre-emptive in nature and used to reduce the negative impact of large subscriptions and redemptions on “non-trading” investors rather than in response to stressed market conditions. This may be an important factor if simulating a “large redemption” stress test. As mentioned

<sup>19</sup> Central Bank (Supervision and Enforcement) Act 2013 (Section 48(1) (UCITS) Regulations 2015, s 87(3)(b) requires that all UCITS MMFs must provide ‘...daily subscriptions and redemptions of units’.

<sup>20</sup> Liquidity management tools must be outlined in constitution documents that are approved by the Central Bank of Ireland. In Ireland, activation does not require pre-approval from the regulator (although guidance on use of certain tools is provided by the Central Bank); however this is not case in other jurisdictions (IOSCO, 2015, pp. 13-15). There are no current rules that require that specific tools be available to funds domiciled in Ireland.

Chart 6: Use of Liquidity Management Tools



Source: Central Bank of Ireland, ESRB.

Note: for definitions see Chart 5.

above, the effectiveness of these tools in preventing 'first-mover advantage' would be useful future research.

## 5. Conclusion & Recommendations

This report highlights the main findings of the ESRB liquidity questionnaire of large Irish bond, mixed and money market funds. In the survey, assets are categorised into cash equivalent and non-cash equivalent assets, based on ratings. We see a broad outline of the liquidity of large Irish domiciled bond, mixed and money market funds. Based on portfolio asset compositions MMFs appear to be the most liquid followed by bond and then mixed funds. This is expected. Below we respond to some questions outlined in the introduction of the paper.

### Is regulation affecting liquidity?

We note that there is some evidence that regulation has reduced liquidity in the highlighted markets. It appears as if it may

have affected some market participants more than others, specifically those affected by new capital requirements. There is some evidence that these have impacted risk appetite and thus liquidity.

### What are the most useful models and tools to use when analysing liquidity?

The survey tells us that asset managers use many models and tools when assessing liquidity, from a Liquidity Cost Score to Monte Carlo simulations. The tests are usually performed at the fund level and on a monthly basis. We also note that funds may use pre-emptive liquidity management tools (such as anti-dilution levies) to disincentivise and manage large redemptions.

### How do we define liquidity?

Liquidity is defined by the ESRB in the quantitative section in a binary sense – cash and non-cash. This is based on ratings. This is a useful guide and is often used by regulators (e.g. Basel III's HQLA) but more granular methods are also outlined in the qualitative section. Asset managers report

they use measures such as trading volumes, the number of daily transactions, average transaction size and bid-ask spreads as measures of liquidity. Challenges will arise for reporting and analysis of these more granular measures but more work is required by central banks and regulators to assess the best definition and measures of liquidity for liquidity stress tests and systemic risk analyses.

### **How do we recreate the dynamics of a financial crisis?**

As over 90 per cent of the sample report the availability of daily redemptions, liquidity and maturity transformation are potential risks, which warrant further analysis. We also learn that asset managers test liquidity under a number of scenarios, for example rising interest rates or credit spreads. Liquidity buffers are dynamic in nature and sensitive to market conditions as asset managers trade-off liquidity against profitability. Our survey shows that a large percentage of funds are held by institutional investors. Of the funds which report investor concentration, two thirds have 100 per cent institutional investors whereas less than 10 per cent state that retail investors hold more than 50 per cent of units. Retail investors have been shown to place more weight on negative signals in stressed market conditions, so this result suggests that the funds in our sample may be less subject to “run risk” than retail investors.

These findings help to describe the landscape of large funds from a liquidity standpoint. The results will aid those looking to evaluate liquidity risk in funds from a regulatory perspective and from a systemic risk perspective.



## Bibliography

AFG, 2015. Code of Conduct on the use of Stress Tests, Paris: The French Asset Management Association.

Ansidei, Julie, Elias Bengtsson, Daniele Frison, & Giles Ward. 2012. Money Market Funds in Europe and Financial Stability. ECB Occasional Paper Series, June, Issue No. 1.

BCBS, 2013. Basel III: The Liquidity Coverage Ratio and liquidity risk monitoring tools, Basel: Bank for International Settlements.

Central Bank of Ireland, 2017a. Macro-financial Review 2017:1. Macro-Financial Review: Dublin, Central Bank of Ireland.

Central Bank of Ireland, 2017b. Resident Monthly Money Market Funds Return (MMM): Notes on Compilation, Dublin: Central Bank of Ireland.

Central Bank of Ireland, 2017c. Resident Investment Funds Return (MMIF): Notes on Compilation, Dublin: Central Bank of Ireland.

Chen, Qi, Itay Goldstein, & Wei Jiang. 2010. Payoff Complementarities and Financial Fragility: Evidence from Mutual Fund Outflows. *Journal of Financial Economics*, Volume 97, pp. 239-262.

Cipriani, Marco, Antonio Martin, Patrick McCabe, & Bruno M Parigi. 2014. *Gates, Fees and Pre-emptive Runs*, New York: Federal Reserve Bank.

Dwyer, Gerald & Paula Tkac. 2009. The financial crisis of 2008 in fixed-income markets. *Journal of International Money and Finance*, Volume 28, pp. 1293-1316.

ECB, 2009. *Manual on Investment Fund Statistics*, Frankfurt: European Central Bank.

ESMA, 2013. *Guidelines on Reporting Obligations under Articles 3(3)d and 24(1), (2) and (4) of the AIFMD*, Paris: European Securities and Markets Authority.

ESMA, 2017. *Report on Trends, Risks and Vulnerabilities*, Paris: European Securities and Markets Authority.

ESRB, 2017. *EU Shadow Banking Monitor*, Frankfurt: European Systemic Risk Board.

FSB, 2017a. *Global Shadow Banking Monitoring Report 2016*, Basel: Financial Stability Board.

FSB, 2017b. *Policy Recommendations to Address Structural Vulnerabilities from Asset Management Activities*, Basel: Financial Stability Board.

IMF, 2016. *Ireland Financial Sector Assessment Program: Technical Note - Asset Management and Financial Stability*, Washington D.C.: International Monetary Fund.

IOSCO, 2015. *Liquidity Management Tools in Collective Investment Schemes*, Madrid: International Organisation of Securities Commissions.

Li, Wei, Ashish Tiwari & Lin Tong. 2016. *Investor Decisions under Ambiguity: Evidence from Mutual Fund Investor Behavior*. *Management Science*, 27 May.

OSC, 2015. *Report on Staff's Continuous Disclosure Review of Mutual Fund Practices Relating to Portfolio Liquidity*, Ontario: Ontario Securities Commission.

Ramirez, Sandra, Jesus Sierra Jimenez, & Jonathan Witmer. 2015. *Canadian Open-End Mutual Funds: An Assessment of Potential Vulnerabilities*. *Financial System Review*, Volume June, pp. 47-55.

RISK, 2016. *Swayed by Swing Pricing? RISK*, Volume January, pp. 14-16.