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**Financial Fragility in Retail-NBFCs**

**V. Ravi Anshuman**

*Professor*

*Finance & Accounting*

*Indian Institute of Management Bangalore*

*Bannerghatta Road, Bangalore – 5600 76*

[anshuman@iimb.ac.in](mailto:anshuman@iimb.ac.in)

**Rajdeep Sharma**

*Doctoral Student*

*Finance & Accounting*

*Indian Institute of Management Bangalore*

*Bannerghatta Road, Bangalore – 5600 76*

[rajdeep.sharma18@iimb.ac.in](mailto:rajdeep.sharma18@iimb.ac.in)

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## Financial Fragility in Retail-NBFCs

### Abstract

This study examines the financial fragility of the Retail Non-Banking Financial Companies (Retail-NBFCs) sector. We show that the liquidity crunch in Retail-NBFCs stemmed from their over-dependence on short-term wholesale funding from Liquid Debt Mutual Funds (LDMFs) and the low level of high-quality liquid investments in the LDMF sector. While such reliance worked well in good times, it generated significant short-term debt rollover problems for Retail-NBFCs during times of stress. The key reason for the inability of Retail-NBFCs to roll over commercial paper was the transmission of systemic risk from Retail-NBFCs to the LDMF sector. Anticipating defaults by Retail-NBFCs, mutual fund investors exited from the LDMF sector. The low levels of high-quality liquid assets in the LDMF sector were insufficient to withstand the concerted redemption pressure by investors and made the LDMF sector reluctant to roll over short-term debt of Retail-NBFCs. We develop a robust tool (Health Score) to estimate financial fragility in a Retail-NBFCs and find that it can predict the constraints on external financing (or rollover risk) faced by these firms.

**Keywords:** shadow banking, Retail-NBFC, liquid debt mutual funds, rollover risk, redemption risk, short-term wholesale funding, interconnectedness risk, financial and operating resilience, health score, cumulative abnormal returns

**JEL Classification:** G01, G14, G23, C23

## 1. INTRODUCTION

To quote (Ghosh et al., 2012), “Shadow banking comprises a set of activities, markets, contracts and institutions that operate partially (or fully) outside the traditional commercial banking sector and are either lightly regulated or not regulated at all. A shadow banking system can be composed of a single entity that intermediates between end-suppliers and end-users of funds, or it could involve multiple entities forming a chain”. Shadow banks do not have explicit access to central bank liquidity. The shadow banking system is highly levered with risky and illiquid assets while its liabilities disposed to “bank runs”.

The NBFC sector is lightly regulated as compared to the traditional banking system consisting of public and private sector banks and other financial institutions. However, the regulation in NBFC sector has evolved over time with prudential norms discouraging deposit-taking by NBFC (Reserve Bank of India (RBI), 1998) and encouraging the entry of non-deposit-taking NBFCs (RBI, 2006). The combination of these two effects has led to a steady decline in the share of deposits and increase in wholesale funding in the funding sources of the NBFCs. The wholesale funding sources of the NBFCs comprise mainly of banks (primarily via term loans and rest through non-convertible debentures and commercial paper) and debt mutual funds (via non-convertible debentures and commercial paper).

The liquidity crunch in the shadow banking system in India took shape in the wake of defaults on loan obligations by major Non-Banking Financial Companies (NBFCs). Two subsidiaries of Infrastructure Leasing & Financial Services (IL&FS) defaulted in the period from June to September 2018, while Dewan Housing Finance Limited (DHFL) defaulted in the period from June to August 2019. Both

these entities defaulted on non-convertible debentures and commercial paper obligations for amounts of approximately Rs. 1500-1700 crores.

IL&FS and DHFL defaulted because they were unable to rollover their commercial paper and non-convertible debenture obligations when payments were due, and they were not able to arrange funding through alternate sources. Every NBFC faces Rollover Risk to some extent due to uncertainty in the future evolution of interest rates or market conditions. Rollover Risk is, therefore, a key source of risk to the financial stability of individual NBFC and to the shadow banking system in general as this risk can quickly spill over to the wider sector due to the interconnectedness to the other segments of the financial sector, and eventually to the real sector. Given the short tenor of commercial paper compared to non-convertible debentures, Rollover Risk is largely driven by the inability of a financial firm to roll over commercial paper, which is subject to renewal on a frequent basis.

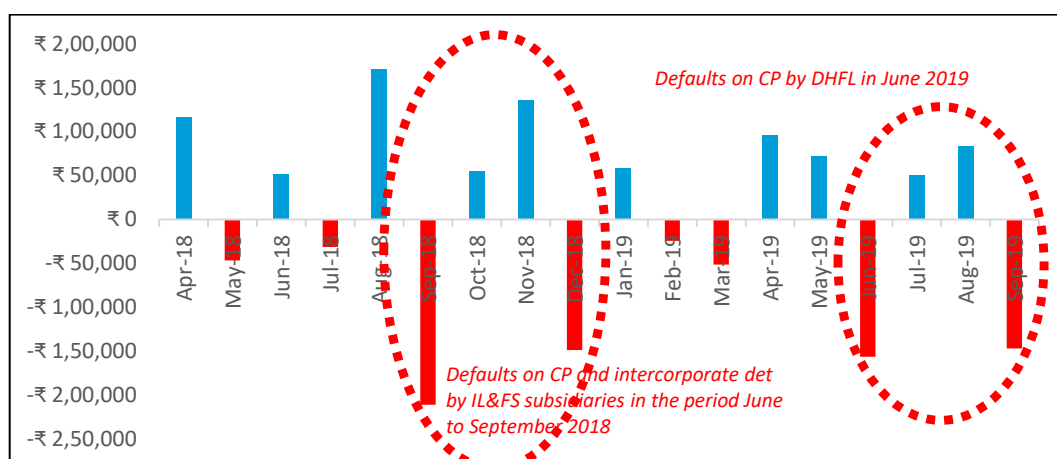
In response to the defaults, mutual funds started selling off their investments in the NBFC sector to reduce exposure to stressed NBFCs. A case in point is DSP Mutual Fund selling DHFL commercial papers (CPs) worth Rs. 300 crores at a steep discount in September 2018.<sup>1</sup>

Panic-stricken investors in debt mutual funds started pulling out their investments in these funds rapidly. Coinciding with the news of defaults by IL&FS and DHFL being known to the wider market, the months of September 2018 and June 2019 saw the highest net outflows from LDMFs and money market funds, as shown in Figure 1.

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<sup>1</sup> Economic Times article titled "DHFL Paper Sale by DSP triggered panic" dated 22<sup>nd</sup> September 2018.

**Figure 1: Net Inflows – Liquid Debt Mutual Funds (LDMFs) & Money Market Funds (Rs. Crore)**



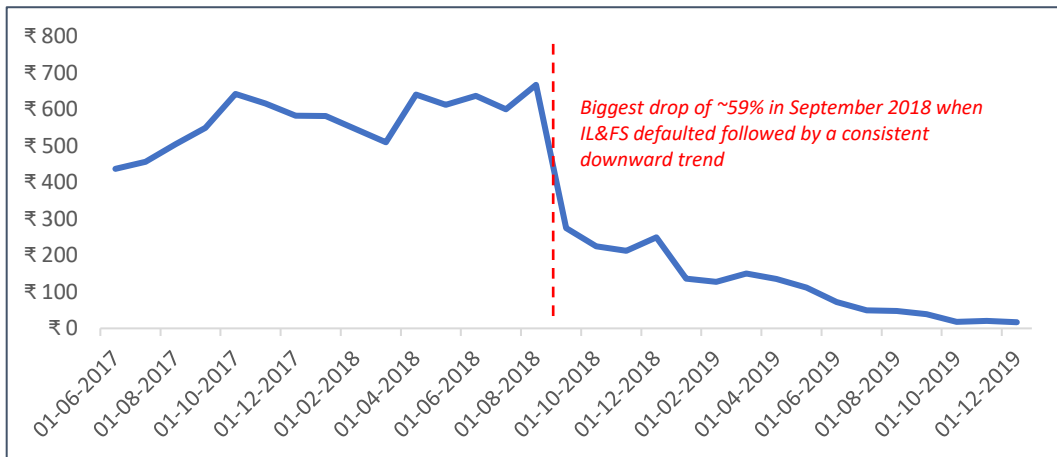
Source: ACE-MF Database, based on a sample of prominent LDMFs

On June 4, 2019, the net asset value of debt funds, which held debt instruments issued by DHFL, fell by 53% in one day when news about its default became public.<sup>2</sup> The drop in net asset value was due to the twin effects of debt mutual funds writing off their investments in stressed NBFCs and asset sales at fire sale prices to meet unexpected high redemptions.

The impact of these defaults was not limited to debt markets. There was a sharp decline in the equity prices of DHFL as equity market participants anticipated repayment troubles at these firms a few months in advance of actual defaults. As illustrated in Figure 2, DHFL had a consistent downward trend in equity prices from May 2018. Interestingly, the plot shows that DHFL’s equity price dipped by ~59% in September 2018 even though actual defaults eventually happened much later in June 2019. Equity investors feared that the high exposure of DHFL to IL&FS could further stretch the finances of the housing finance company.

<sup>2</sup> NewsClick article titled “Mutual Funds in Trouble as Housing Finance Firm DHFL Defaults on Debt Repayment” dated 6<sup>th</sup> June 2019.

**Figure 2: Trend in Equity Price (DHFL)**

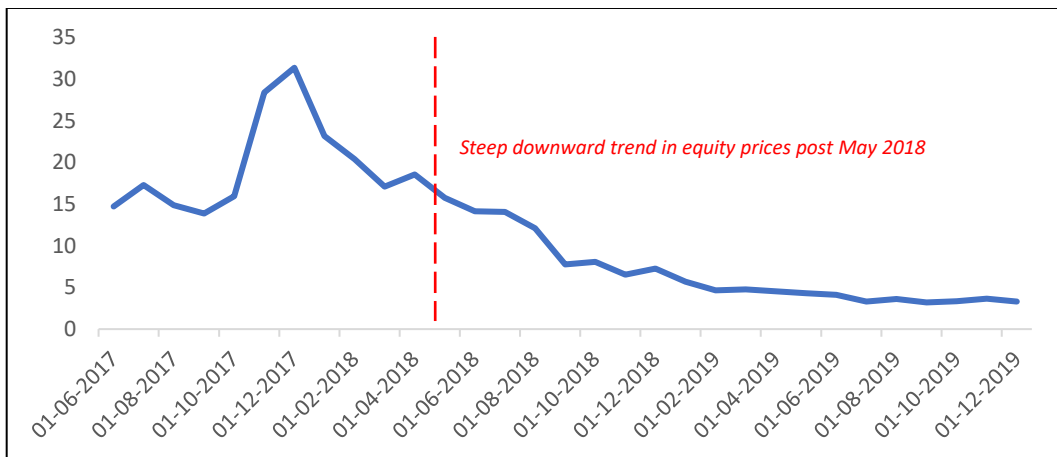


Source: Bloomberg

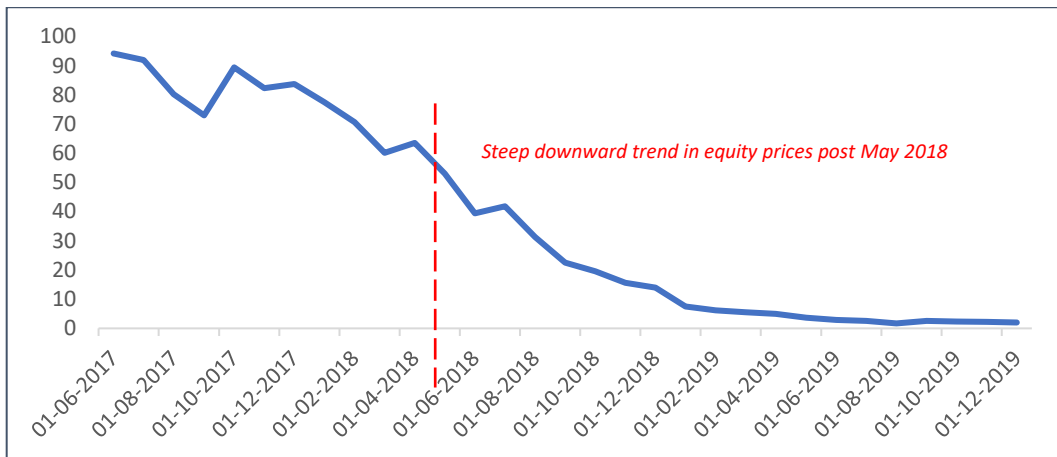
Figure 3 illustrates the trend in equity prices for the three listed subsidiaries of IL&FS. All of them exhibited a consistent downward trend around and post defaults by the IL&FS subsidiaries.

**Figure 3: Trend in Equity Price (July 2017- December 2019)**

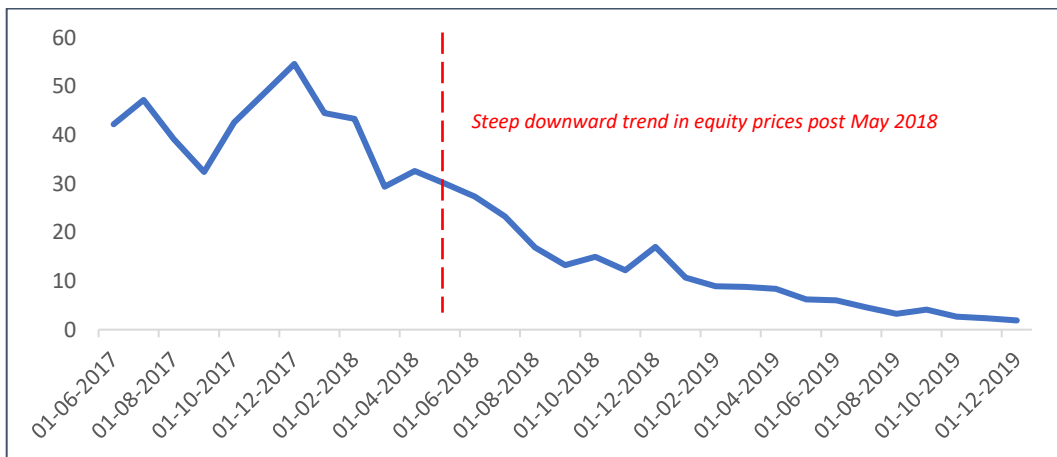
**IL&FS Investment Managers**



## IL&FS Transportation Networks Ltd.



## IL&FS Engineering and Construction Company Ltd.



Source: Bloomberg

We, therefore, find evidence that both debt and equity investors suffered a massive erosion in wealth due to the defaults. To get a sense of the quantum of losses, debt mutual funds with exposure to IL&FS lost approximately Rs. 4000 crores after adjusting for recoveries in the aftermath of defaults.<sup>3</sup> Debt mutual funds, facing increasing redemptions, were hesitant to finance the NBFC sector. This, in

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<sup>3</sup> LiveMint article titled "Debt Mutual Funds: Quantum of Loss and Solace" dated 29<sup>th</sup> April 2019.

turn, led to the difficulty of NBFCs to raise funds, which took a toll on the overall credit growth in the Indian economy and a decline in GDP.

Given the significant economic impact of the liquidity crisis on the national economy, it would be a fruitful exercise to investigate whether there were any early warning signs of stress in the NBFC sector. Our focus in this paper is on one of the most important segments of the NBFC sector in India, namely, Retail-Non-Banking Financial Companies (Retail-NBFCs).

In this paper, we analyse the Rollover Risk of a sample of Retail-NBFCs with the objective of identifying the firms that are most vulnerable during periods of liquidity crunch in the wholesale funding markets. We develop an index to estimate the financial fragility of the Retail-NBFCs and find that it can predict the constraints on external financing (or refinancing risk) faced by these firms. Using the index, we also estimate the financial fragility of the Retail-NBFC sector. We call this index the Health Score, which ranges between -100 to +100 with higher scores indicating higher financial stability of the firm.

The Health Score employs information on the key drivers of refinancing risk such as excess reliance on short-term wholesale funding (Commercial Paper), the level of liquid investments in the Liquid Debt Mutual Funds (LDMFs) sector and balance sheet strength of the Retail-NBFCs. We did not find evidence of Asset Liability Management (ALM) problem in Retail-NBFCs unlike the Housing Finance (HFC) sector which had severe ALM problems (Anshuman et al., 2020). We demonstrate that the Health Score can serve the critical role of predicting refinancing related stress faced by the financial firms in advance. It can serve as an important monitoring mechanism to prevent such problems in future. Furthermore,



disaggregating the components and examining their trends can shed light on how to regulate Retail-NBFCs.

On running fixed-effects panel regression models of change in Health Scores on second quarter Cumulative Abnormal Returns (Q2\_CAR) of three size-based portfolios of Retail-NBFC stocks, we find statistically and economically significant results. Specifically, we observe that change in Health Scores is a significant predictor of future abnormal returns of these portfolios.

Other than its utility as a leading indicator of stress in the Retail-NBFC sector, the Health Score can also be used by policy makers to allocate scarce capital to stressed Retail-NBFCs in an optimal way to alleviate a liquidity crisis.

To summarize, redemption pressure faced by debt mutual funds is akin to a “bank run”, which is a characteristic of any crisis in the financial sector. The redemption pressure gives rise to refinancing risk (Rollover Risk) for Retail-NBFCs, thereby affecting the real sector. The extent of refinancing risk faced by Retail-NBFCs is fundamentally driven by their reliance on short-term wholesale funding. We analyze the mechanisms through which the reliance on short-term wholesale funding is manifested with an aim to develop a quantifiable measure (Health Score) that can predict stress in the Retail-NBFC sector.

The rest of the discussion is organized as follows. Section 2 posits a framework for understanding the determinants of Rollover Risk faced by any NBFC. Section 3 provides a brief description of our dataset. Section 4 details the key drivers of Rollover Risk of the Retail-NBFC sector. Section 5 explains the methodology of computing Rollover Risk of Retail-NBFCs, illustrates the trends in Rollover Risk

for Retail-NBFCs. We also present the econometric models and the key results. Section 6 concludes with important policy implications from our analysis.

## **2. ROLLOVER RISK – POTENTIAL DETERMINANTS**

In the context of the liquidity crisis in the NBFC sector, we build a conceptual framework based on the following insights:

- (i) NBFCs raise capital in the short-term (1-3 months) commercial paper (CP) market at a lower cost, as compared to the long term (5-10 years) non-convertible debenture (NCD) market but face the risk of rolling over the CP debt at short frequencies of a few months.<sup>4</sup> The frequent repricing exposes NBFCs to the risk of facing higher financing costs and, in the worst case, credit rationing. We refer to such refinancing risks as Rollover Risk.
- (ii) When an asset-side shock reduces expected future cashflows for an NBFC, it adversely affects the ALM problem in the NBFC and thereby risk perceptions about the NBFC.
- (iii) Such a shock amplifies the NBFC's problems when its liability structure is over-dependent on short-term wholesale funding such as commercial paper, which requires frequent refinancing.
- (iv) The LDMF sector is a primary source of short-term wholesale funds in the NBFC sector.<sup>5</sup> This interconnectedness is a channel for the transmission of

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<sup>4</sup> For one of the largest HFCs, the rate of interest on CP was 7.01% - 8.00% while that on NCD was 10.01% – 11.95%, as of 31 March 2019.

<sup>5</sup> The share of CP issued by NBFCs that are subscribed to by mutual funds was the highest (79.7% as of 31 March 2019) among all classes of subscribers (Retail-NBFC Credit Trends: ICRA Report, July 2019). Among mutual funds, LDMFs have the highest share of investments in CP (~80% on average), which is highlighted in Figure 11, sub-section 3.2. Together, these two facts suggest that the LDMF sector is a primary source of short-term wholesale funds in the NBFC sector.

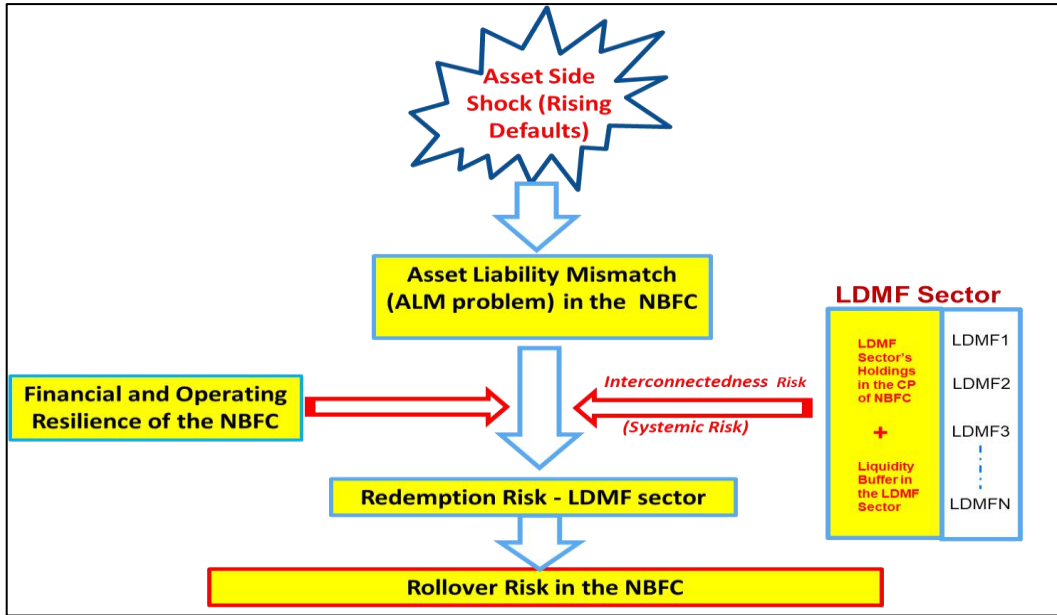
systemic risk from the NBFC sector to the LDMF sector. Shocks in the NBFC sector may lead to concerted redemptions by investors in the LDMF sector at fire-sale prices. Faced with this situation, LDMFs may withdraw funding to the NBFC sector when refinancing is due. Such a reinforcing cycle can quickly turn into a vicious cycle, leading to a liquidity crisis in the NBFC sector. More technically, systemic risk is transmitted from the NBFC sector to the LDMF sector and vice-versa, i.e., interconnectedness causes systemic risk transmission between an NBFC sector and the LDMF sector.

- (v) In general, if the quantum of defaults is large enough (as was the case with IL&FS and DHFL), it can spread panic among the investors in CP leading to concerted redemptions in the LDMF sector (systemic risk within the LDMF sector). Moreover, the liquidity crunch in an NBFC adversely affects risk perceptions about other NBFCs when they are due for rolling over their CP obligations. Hence, Rollover risk, initially contained within a few NBFCs may rapidly spillover and affect the entire NBFC sector (systemic risk within the NBFC sector).
- (vi) The key drivers of the redemption problem in the LDMF sector, and thereby the Rollover Risk problem in the NBFC sector, are threefold: The first risk stems from the magnitude of the ALM problem in the NBFC. The second risk originates from the interconnectedness of the NBFC with the LDMF sector. This risk depends on the extent to which an NBFC relies on short-term wholesale funding and the liquidity buffers in the LDMF sector to absorb redemption pressure. The third risk stems from the inherent resilience of the NBFC, as reflected in the strength of the balance sheet, which allows it to absorb shocks in the first place.

- (vii) These three risks work in tandem to cause Rollover Risk. At the time of refinancing their CP obligations, the NBFCs having stronger balance sheets are successful in rolling over CPs, albeit at a higher cost. Other NBFCs with weaker balance sheets face higher default probabilities and find it difficult to access the CP market at affordable rates or are unable to raise money at all, i.e., they are unable to avoid default.
- (viii) At the most fundamental level, the root cause of the liquidity crisis in the NBFC sector can be traced to the over-dependence of NBFCs on the short-term wholesale funding market. This factor works through two channels, a direct channel and an indirect channel. First, an increase in short-term wholesale funding causes a direct effect by increasing the amount of funding that is subject to frequent repricing, and therefore, Rollover Risk. Second, there are indirect effects in that an increase in short-term wholesale funding influences the two key drivers of Rollover Risk - it worsens the ALM mismatch problem and increases the degree of interconnectedness of the NBFC sector with the LDMF sector. In addition, if the NBFC's balance sheet strength is suspect, Rollover Risk is further exacerbated. In short, over-dependence on short-term wholesale funding has direct and indirect impact on Rollover Risk.

Figure 4 illustrates the drivers of Rollover Risk in the NBFC sector. Redemptions pressures in the LDMF sector are exacerbated when NBFCs face an asset-side shock and experience an ALM problem, which gets compounded due to interconnectedness and lack of balance sheet resilience. Faced with redemption pressures, the LDMF sector is reluctant to roll over loans to the NBFC sector (Rollover Risk), causing a liquidity crunch in the NBFC sector.

**Figure 4: Rollover Risk Schematic ( NBFC Sector)**



### 3. DATA

#### 3.1. Retail-NBFCs

We select a set of top fifteen private sector NBFCs’ operating in the retail credit segment for our analysis. These Retail-NBFCs have Assets under Management (AUM) of INR 6.8 trillion while the total AUM of the industry including PSU’s is INR 9.1 trillion as of 31 March 2019. These fifteen Retail- NBFCs’, therefore, control ~75% of the market and serves as a good proxy for the Retail-NBFC sector. We classify the fifteen Retail-NBFCs into large, medium and small-sized Retail-NBFCs where each group consists of five firms. We sort the firms into three groups based on AUM, which is a proxy for size, because there is large between group variation in efficiency measures.

We collect data on several other metrics from the annual reports of these Retail-NBFCs from March 2014 till March 2019. Summary Statistics for our sample of are reported in Table 1.

**Table 1: Summary Statistics (Retail-NBFCs)**

The following table presents the summary statistics of key balance sheet metrics of the fifteen largest Retail-NBFCs from March 2015 till March 2019. Loan Book is the total loans outstanding in INR crores. CP as a % of Borrowings is the share of commercial paper in borrowings. Opex Ratio is the ratio of operating expenses (excluding interest expenses and provisioning) to the average of the current and previous financial year end loan book. The remaining metrics are self-explanatory. Loan Book and Gross NPA are computed as of 31<sup>st</sup> March in each financial year. CP as a % of Borrowings, Cash as a % of Borrowings and Capital Adequacy Ratio are computed as the average of the current and previous financial year end figures.

Variables	Obs.	Median	Mean	Std. Dev	Min.	Max.
Panel A: Large NBFCs'						
<i>Loan Book (Rs. Crs)</i>	25	44,469	52,730	23,469	19,290	1,04,482
<i>CP as a % of Borrowings</i>	25	6.86%	6.61%	3.70%	0.00%	14.18%
<i>Cash as a % of Borrowings</i>	25	2.16%	3.05%	3.20%	0.33%	15.20%
<i>Opex Ratio (% of Loan Book)</i>	25	3.48%	4.18%	1.38%	2.53%	7.53%
<i>Gross NPA (% of Loan Book)</i>	25	3.40%	4.26%	2.99%	0.83%	9.84%
<i>Capital Adequacy Ratio (%)</i>	25	19.16%	19.43%	1.59%	17.16%	22.69%
Panel B: Medium NBFCs'						
<i>Loan Book (Rs. Crs)</i>	25	27,461	28,256	11,180	3,477	50,200
<i>CP as a % of Borrowings</i>	25	17.58%	15.81%	9.24%	0.00%	30.66%
<i>Cash as a % of Borrowings</i>	25	1.41%	2.86%	3.27%	0.18%	13.41%
<i>Opex Ratio (% of Loan Book)</i>	25	4.98%	5.12%	0.96%	3.33%	8.18%
<i>Gross NPA (% of Loan Book)</i>	25	3.31%	3.94%	2.44%	0.47%	9.38%
<i>Capital Adequacy Ratio (%)</i>	25	17.50%	20.09%	4.20%	15.84%	27.49%
Panel C: Small NBFCs'						
<i>Loan Book (Rs. Crs)</i>	25	13,514	15,604	5,726	9,295	28,133
<i>CP as a % of Borrowings</i>	25	14.54%	14.95%	8.91%	0.54%	36.11%
<i>Cash as a % of Borrowings</i>	25	5.04%	5.76%	2.13%	2.90%	10.97%
<i>Opex Ratio (% of Loan Book)</i>	25	4.92%	5.30%	1.97%	2.79%	8.87%
<i>Gross NPA (% of Loan Book)</i>	25	1.43%	2.86%	3.00%	0.54%	10.77%
<i>Capital Adequacy Ratio (%)</i>	25	18.55%	20.03%	3.10%	16.45%	26.66%

Table 1 shows that the NBFCs' in Panel A, B and C differ with respect to mean and median Loan Book and mean Opex Ratio (due to economies of scale). Ten out of the fifteen Retail-NBFCs in our sample were listed on National Stock Exchange (NSE) or Bombay Stock Exchange (BSE) or both. For our regression analysis, we collect data on weekly stock prices of these fifteen Retail-NBFCs starting from March 2014 till March 2019. Concurrently, we also collect data on NIFTY 500 index for computing abnormal returns for these stocks. The source of data for the market prices is Bloomberg.

### **3.2. Liquid Debt Mutual Funds**

For computing the rollover risk score of Retail-NBFCs, we collect data on the month-on-month portfolio holdings of the top fifteen LDMFs in the Retail-NBFC sector and their overall corpus from March 2014 till March 2019. The top fifteen LDMFs control ~70% of the AUM of the LDMF sector and is representative of the risks emanating out of the Retail-NBFC and LDMF sector interlinkages.

## **4. DRIVERS OF ROLLOVER RISK (Retail-NBFCs)**

Retail-NBFCs typically invest in shorter duration working capital loans to MSME, automobile sector financing loans or gold loans. These loans are financed by banks (in the form of term loans) and debt mutual funds (in the form of NCD and CP). Among debt mutual funds, the LDMF sector is a primary source of short-term wholesale funds in the Retail-NBFC sector. Thus, the Retail-NBFC sector is intricately connected with the Liquid Debt Mutual Fund (LDMF) sector. Due to the high level of interconnectedness, asset side shocks expose Retail-NBFCs to the risk of being unable to finance their business. However, Retail-NBFCs with robust balance sheets can withstand external financing constraints for longer periods. In the context of the Retail-NBFC sector, we analyze the key drivers of Rollover Risk as follows: -

### **4.1. Risks from Interconnectedness**

Interconnectedness between the NBFC and LDMF sector is a channel for the transmission of systemic risk from the NBFC sector to the LDMF sector. Shocks in the NBFC sector may lead to concerted redemptions by investors in the LDMF sector at fire-sale prices. Faced with this situation, LDMFs may withdraw funding to the NBFC sector when refinancing is due. More technically, systemic risk is

transmitted from the NBFC sector to the LDMF sector and vice-versa, i.e., interconnectedness causes systemic risk transmission between an NBFC sector and the LDMF sector.

In general, if the quantum of defaults is large enough (as was the case with IL&FS and DHFL), it can spread panic among the investors in CP leading to concerted redemptions in the LDMF sector (systemic risk within the LDMF sector). Moreover, the liquidity crunch in an NBFC adversely affects risk perceptions about other NBFCs when they are due for rolling over their CP obligations. Hence, Rollover risk, initially contained within a few NBFCs may rapidly spill over and affect the entire NBFC sector (systemic risk within the NBFC sector).

Interconnectedness Risk is a measure of the transmission of systemic risk between an NBFC and the LDMF sector that arises from two factors. First, if the LDMF sector, on average, holds concentrated positions in the CPs of a specific *stressed* NBFC, it may lead to a greater redemption risk from their own investors who fear rise in default probabilities due to deterioration of asset quality of the NBFC. We measure this factor by the LDMF sector's average exposure to CP issued by the NBFC.

Second, LDMFs are subject to run risk or redemption risk from their investors if their cash holdings do not account for extreme tail events. Thus, low levels of cash holdings in the LDMF sector, on average, diminish the ability of the LDMF sector to absorb redemption pressures.

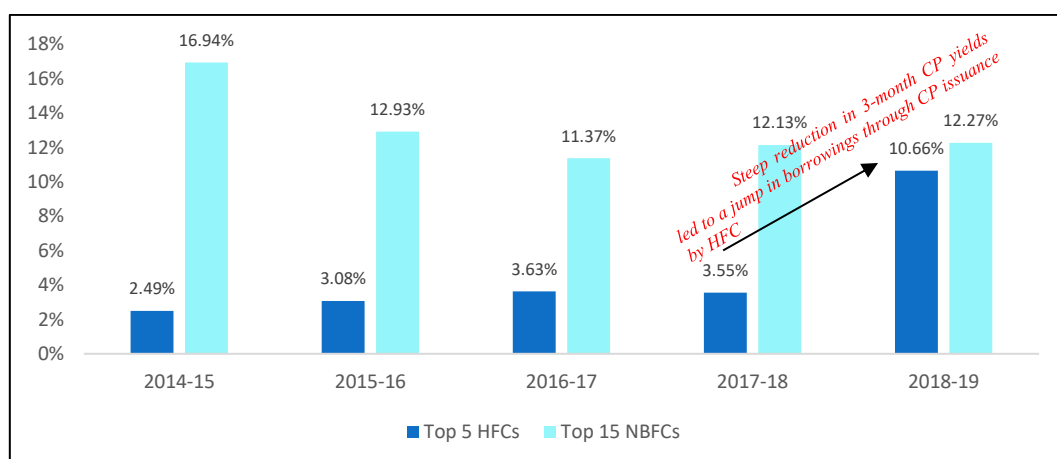
We refer to the combined impact of these two factors as the Interconnectedness Risk, which increases the likelihood of concerted redemption by investors across



the entire LDMF sector, leading to fire sales of LDMF assets. These redemptions increase Rollover Risk in a vicious cycle for the stressed NBFCs.

To shed light on the first factor driving Interconnectedness Risk, we provide a comparison of the average dependence of the Retail-NBFC and the HFC sector on the LDMF sector, as shown in Figure 5. This dependence is measured by the average of the ratio of commercial paper of the *specific* Retail-NBFC/HFC held by the LDMF sector and the total commercial paper holdings of the LDMF sector in the overall Retail-NBFC/HFC sector. We then average the dependence over the Retail-NBFC/HFC sector and track the figures from 2014 till 2019.

**Figure 5: YoY Average Dependence of Retail-NBFC/HFC Sector on the LDMF Sector**

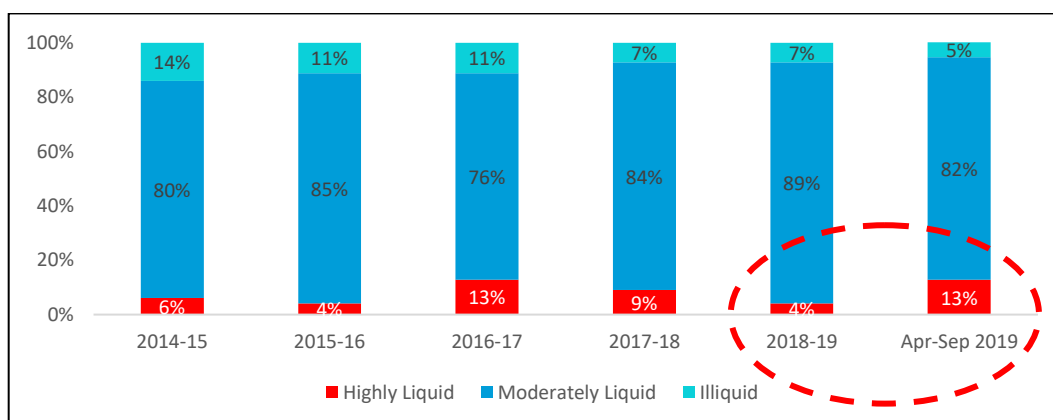


Source: ACE-MF Database

The average dependence for the Retail-NBFC sector from March 2014 till March 2019 was 13.13% while the average dependence for the HFC sector was 4.68% during the same period. Although the average dependence of the HFC sector had spiked in financial year 2019, the dependence was lower than that of Retail-NBFCs in four out of five years. The figure also illustrates that interconnectedness with the LDMF sector is a major contributor to Rollover Risk for the Retail-NBFC sector, but it is not so for the HFC sector.

Turning to the second factor driving Interconnectedness Risk, we plot the asset class wise holdings of the LDMFs in our sample from March 2014 till March 2019, as shown in Figure 6. The proportion of highly liquid investments such as cash, G-secs etc., is a measure of the Liquidity Buffer in the LDMF sector. Higher the Liquidity Buffer, lower is the redemption risk faced by the LDMFs and by extension the Rollover Risk faced by Retail-NBFCs. We observe a steep jump in the average level of highly liquid investments of LDMFs post the IL&FS and DHFL defaults, probably in anticipation of higher than usual redemptions.

**Figure 6: Liquidity Buffer of Top Fifteen LDMFs (percentage of AUM)**



Source: ACE-MF Database

\*Note: Highly liquid investments include cash and cash equivalents, G-secs, T-bills, Bills rediscounting and cash management bills. These are the most liquid investments having the lowest liquidity risk. Moderately liquid investments include certificates of deposits (CD) and commercial paper (CP). Illiquid investments include corporate debt, (NCD), deposits, floating rate instruments and pass-through certificates/securitized debt.

## 4.2. Reliance on Short-Term Wholesale Funding

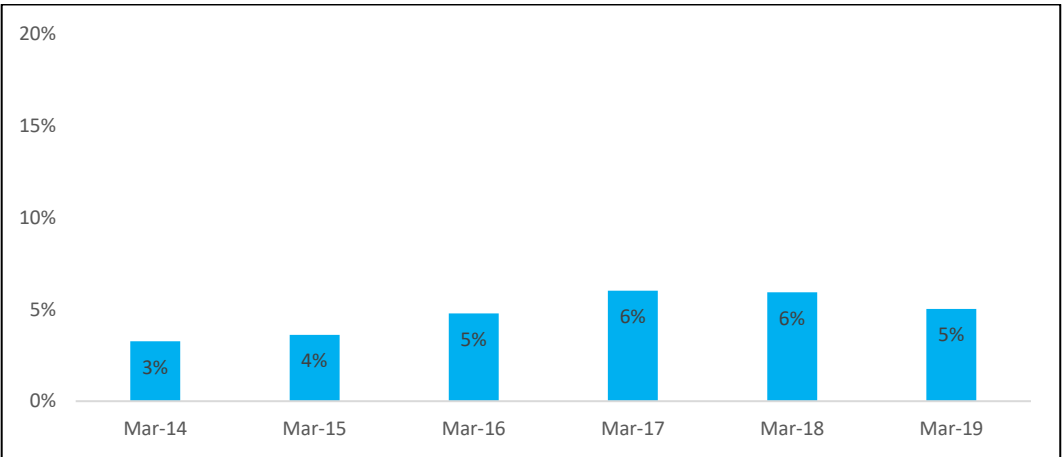
Hahm, Shin and Shin (2013) have found that legacy banks with more reliance on deposit funding are safer than banks that depend heavily on wholesale funding. Defaults on wholesale funding obligations by Infrastructure Leasing and Financial Services (IL&FS) in September 2018 and more recently by Dewan Housing Finance Limited (DHFL) in June 2019 exposed the risks of heavy reliance on

wholesale funding sources, consistent with the findings of Hahm, Shin and Shin (2013).

The sources of wholesale funding for the Retail-NBFCs are bank loans, non-convertible debenture (NCD) and commercial paper (CP) which are subscribed to by debt mutual funds and a small fraction of public deposits. Within wholesale funding, bank loans and public deposits are relatively stable sources of funding while NCD and CP are more volatile. In addition, increased share of CP in the wholesale funding mix worsens the asset liability mismatch in the shorter tenor buckets for the Retail-NBFC.

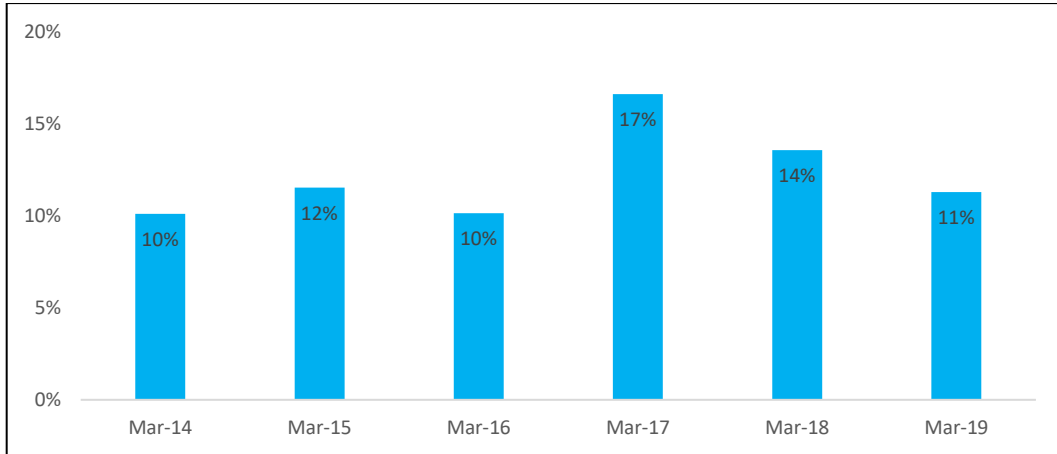
Figure 7 plots the reliance on short-term wholesale funding (CP as a percentage of liabilities) for the large, medium and small-sized Retail-NBFCs.

**Figure 7: Commercial Paper as a percentage of Liabilities  
Large-sized Retail-NBFCs**



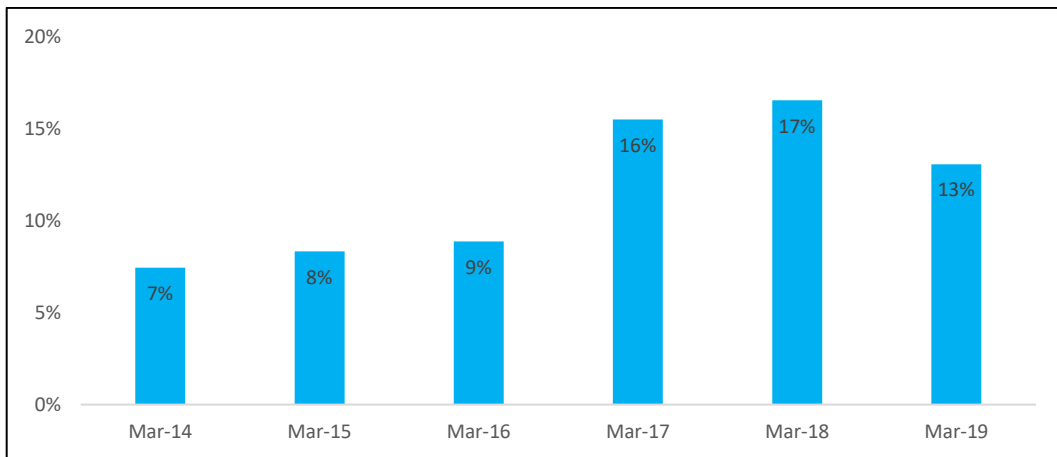
Source: Annual Reports 2014-2019, Retail-NBFCs

### Medium-sized Retail-NBFCs



Source: Annual Reports 2014-2019, Retail-NBFCs

### Small-sized Retail-NBFCs



Source: Annual Reports 2014-2019, Retail-NBFCs

Small and medium Retail-NBFCs have high exposure to short-term wholesale funding (11.5% - 12.5% on average) which makes Interconnectedness Risk an important driver of Rollover Risk without causing asset liability mismatch. The large Retail-NBFCs are in a better position as their exposure to short-term wholesale funding is low enough (5%-6.5% on average) to maintain Interconnectedness Risk within reasonable levels.

### **4.3. Asset Liability Management (ALM) problem**

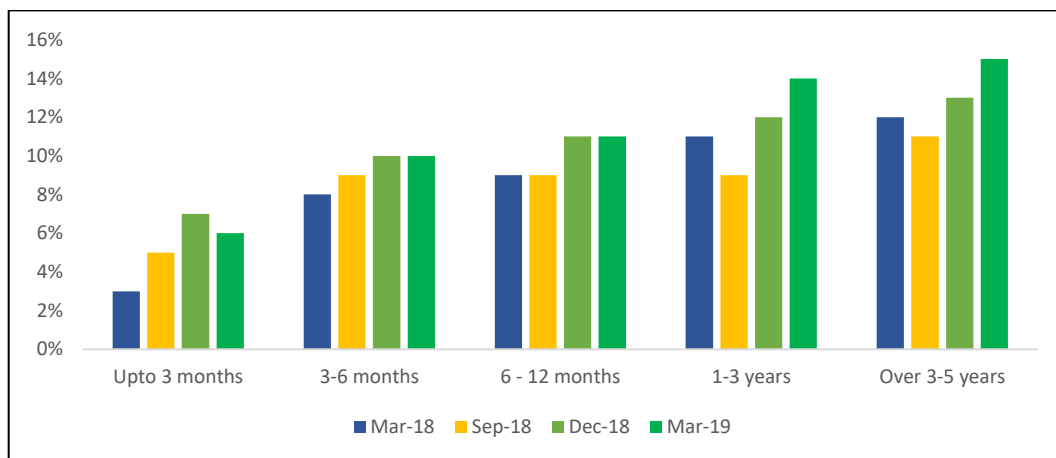
This risk arises in most financial institutions due to a mismatch in the duration of assets and liabilities. Liabilities are of much shorter duration than assets which tend to be of longer duration, especially loans given to housing sector (duration of 15-20 years on average). If cash flows from the long-term assets are inadequate to meet its immediate debt obligations, the Retail-NBFC can still repay its obligations by issuing fresh CP to avoid defaulting. However, such a refinancing strategy works well only when there are no asset side shocks or liability side shocks.

During periods of stress, there may be a significant drop in periodic cash flows that would normally arise from the Retail-NBFC's long-term assets. This exacerbates Rollover Risk. When an adverse asset-side shock reduces the Retail-NBFC's expected future cashflows, it adversely affects the ALM problem in the Retail-NBFC and thereby risk perceptions about the Retail-NBFC. The ALM problem also increases the likelihood of defaults. The ALM problem becomes worse as the share of CP in the wholesale funding mix increases. Also, as the share of shorter duration CP in the wholesale funding mix increases, we expect to observe asset liability mismatch to be more pronounced in the less than 1-year tenure buckets. Thus, an asset-side shock amplifies the Retail-NBFC's problems when its liability structure is over-dependent on short-term wholesale funding such as CP, which requires frequent refinancing. When the time for refinancing the CP obligations comes, the Retail-NBFC's having higher default probabilities (on account of ALM problem), find it difficult to access the CP market at affordable rates or are unable to raise money at all. Inability to arrange alternate funding sources soon enough can lead to actual defaults by these Retail-NBFCs.

If the quantum of defaults is large enough (as was the case with IL&FS and DHFL), it can spread panic among the investors in CP leading to a liquidity crunch in the sector. The liquidity crunch affects other relatively safer Retail-NBFCs when they have to rollover their CP obligations. Hence, Rollover Risk, initially contained within few Retail-NBFCs, may rapidly spill over and affect the entire sector.

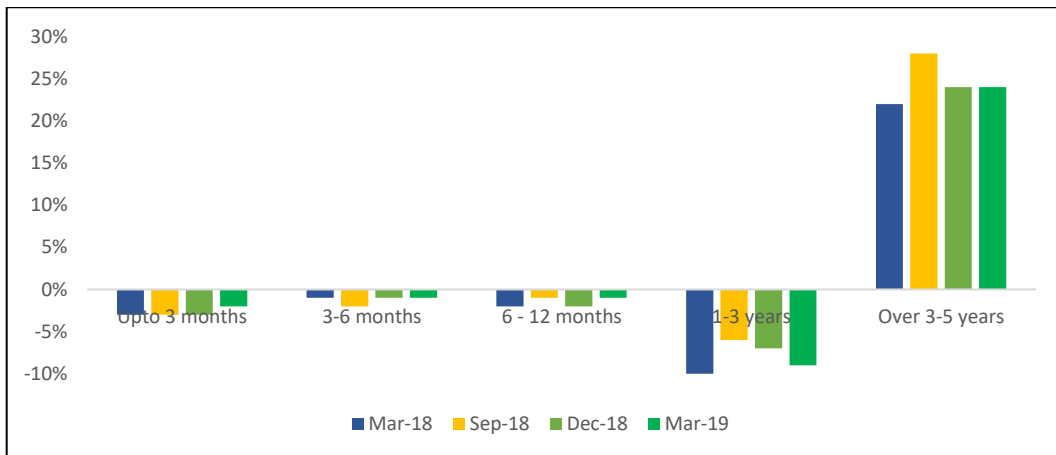
Figure 8 illustrates that the ALM risk is less problematic for Retail-NBFCs compared to HFCs based on a quarter-on-quarter comparison of trends in ALM profile. This is because Retail-NBFCs typically invest in shorter duration working capital loans (1-3 years) to MSME, automobile sector financing loans or gold loans. We observe that assets are greater than liabilities across all maturity buckets for the sector. However, for the HFC sector, assets are lesser than liabilities in all maturity buckets up to 3 years. Therefore, ALM mismatch is *not* a major driver of Rollover Risk for the Retail-NBFC sector when compared to the HFC sector.

**Figure 8: ALM Profile  
Retail-NBFC Sector**



Source: Retail-NBFC Credit Trends: ICRA Report, July 2019

## ALM Profile (HFC Sector)



Source: Indian Mortgage Finance Market: ICRA Reports, November 2018, March 2019, June 2019.

At the most fundamental level, the root cause of the liquidity crisis in the Retail-NBFC sector can be traced to the over-dependence of Retail-NBFCs on the short-term wholesale funding market. This factor works through two channels, a direct channel and an indirect channel. First, an increase in short-term wholesale funding causes a direct effect by increasing the amount of funding that is subject to frequent repricing, and therefore, Rollover Risk. Second, there is an indirect effect in that an increase in short-term wholesale funding worsens the Interconnectedness Risk. In addition, if the Retail-NBFC's balance sheet strength is suspect, Rollover Risk is further exacerbated. In short, over-dependence on short-term wholesale funding has direct and indirect impact on Rollover Risk.

### 4.4. Financial and Operating Resilience

Liquidity crunch in debt markets often leads to credit rationing. Credit rationing results when firms with robust financial and operating performance get access to credit while the less robust ones are denied credit. Firms with robust financial and operating performance can withstand a prolonged period of liquidity crunch if they choose not to raise funds from debt mutual funds. Thus, the financial and operating resilience of Retail-NBFCs allows it to absorb asset side shocks.

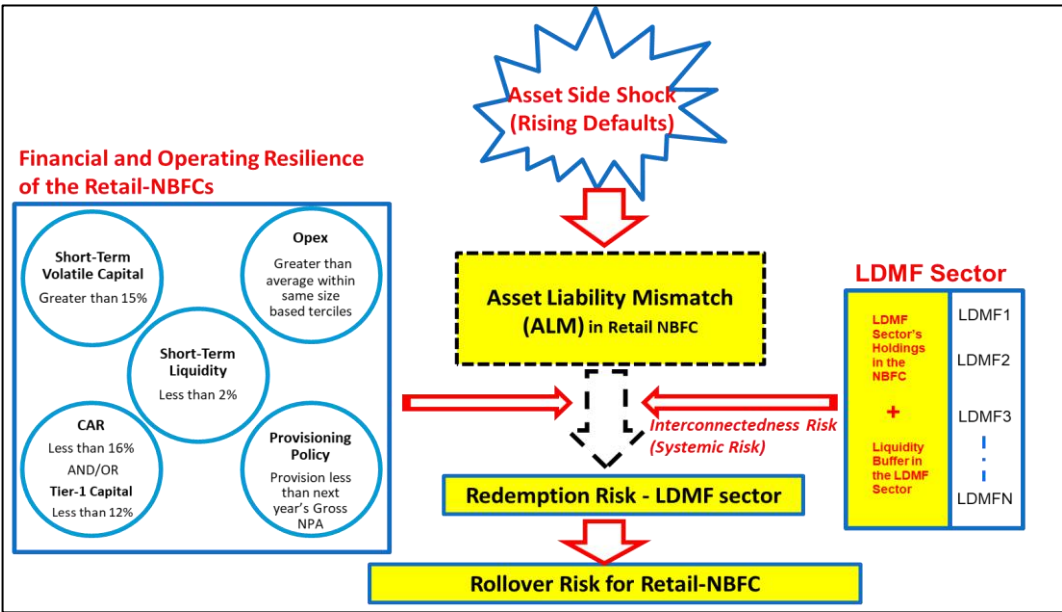
Measures of financial resilience of Retail-NBFCs are commercial paper (CP) as a percentage of borrowings, Capital Adequacy Ratio (CAR) and provisioning policy, while measures of operating resilience are cash as a percentage of borrowings and operating expense ratio (Opex Ratio).

To develop policy implications, we employ financial metrics to estimate the drivers of Rollover Risk and weigh them appropriately based on their relative contribution to Rollover Risk. This procedure helps us generate a measure of the health of a Retail-NBFC. We call this measure the Health Score, which is an indicator of potential rollover risk issues faced by a Retail-NBFC. The validity of this indicator as a predictor of future performance is also tested using market data.

**4.5. Rollover Risk Schematic**

Figure 9 is a schematic of the various drivers of Rollover Risk for the Retail-NBFC sector. Interconnectedness Risk and the Financial and Operating Resilience are strong effects while ALM Risk is a weak effect.

**Figure 9: Rollover Risk Schematic (Retail-NBFCs)**



*Solid Red Arrows - Strong Effect*  
*Dotted Black Arrows - Weak Effect*



## **5. DIAGNOSTIC TO ASSESS FINANCIAL FRAGILITY (Retail-NBFCs)**

In this section, we develop a methodology to estimate a dynamic health index for an individual Retail-NBFCs (We refer to this index as the Health Score) using data on the fifteen Retail-NBFCs in our sample from March 2014 till March 2019. Our overall finding is that the Health Score of the Retail-NBFC sector was consistently below par for the period 2014 till 2019. Further, we find that the large Retail-NBFCs had higher Health Scores but among the medium and small Retail-NBFCs, the medium size Retail-NBFCs had a lower Health Score for the entire period from March 2014 till March 2019.

Finally, we demonstrate that the change in Health Score is a significant predictor of future abnormal returns of the three size-based portfolios of the Retail-NBFCs. The Health Score, therefore, can serve as a timely indicator of future performance of these firms and, by extension, the overall sector.

### **5.1. Key Metrics affecting Health Score of Retail-NBFCs**

Based on the relative contribution to Rollover Risk, we combine the key drivers of Rollover Risk for Retail-NBFCs to compute the Health Score. Interconnectedness Risk between an NBFC and the LDMF sector and Financial and Operating Resilience are the most important constituents of Health Score of Retail-NBFCs, as shown earlier in the Health Score schematic for the Retail-NBFC sector. Interconnectedness Risk arises from both the LDMF sector exposure to CP issued by Retail-NBFCs (Metric 1) and Liquidity Buffer levels in the LDMF Sector (Metric 2). We also illustrated that ALM Risk was low for the Retail-NBFC sector and, therefore, not a key driver of Rollover Risk for these firms.

Metrics 1 and 2 capture the Interconnectedness Risk and Metrics 3-7 capture the Financial and Operating Resilience of Retail-NBFCs. Metrics 3, 6 and 7 are measures of Financial Resilience while Metrics 4 and 5 are measures of Operating Resilience for the Retail-NBFCs. Together, they reflect the Financial and Operating Resilience of Retail-NBFCs.

**Metric 1 – LDMF sector exposure to CP issued by Retail-NBFCs** – If the LDMF sector, on average, holds concentrated positions in the CPs of a specific *stressed* NBFC, it may lead to a greater redemption risk from their own investors who fear rise in default probabilities due to deterioration of asset quality of the NBFC. We measure this factor by the LDMF sector’s average exposure to CP issued by the NBFC. This is measured by the average of the ratio of commercial paper of the *specific* Retail-NBFC held by the LDMF sector and the total commercial paper holdings of the LDMF sector in the overall Retail-NBFC sector.

**Metric 2 – Liquidity Buffer levels in the LDMF Sector** - LDMFs are subject to run risk or redemption risk from their investors if their cash holdings do not account for extreme tail events. Thus, low levels of cash holdings in the LDMF sector, on average, diminish the ability of the LDMF sector to absorb redemption pressures. Metric 2 is measured by the average proportion of highly liquid investments such as cash, G-secs etc., that are held by the LDMFs as a proportion of their AUM.

**Metric 3 – Short-Term Volatile Capital (CP as a percentage of Borrowings)** – CP, being shorter duration loans, are subject to frequent refinancing. The frequent repricing exposes Retail-NBFCs to the risk of facing higher financing costs and, in the worst case, credit rationing. High level of CP increases the quantum of funding required to be refinanced and thereby increased Rollover Risk. In addition, financing of long-term housing loans with CP leads to negative asset liability gap

in the shorter tenor buckets. This is a risky strategy if the company is unable to roll over CPs when there is liquidity shock to the CP market.

**Metric 4 – Operating Expense Ratio (Opex Ratio)** - Operating expense ratio (Opex Ratio) in any financial year is operating expenses divided by the average of the loans outstanding in the current financial year end and previous financial year end. Opex Ratio is an indicator of efficiency of Retail-NBFCs. Economies of scale determine the optimum level of the operating expense ratio – Larger Retail-NBFCs are expected to have a lower level of operating expense ratio relative to smaller Retail-NBFCs. During tight liquidity conditions, credit rationing occurs, and credit is allocated to the more efficient Retail-NBFCs while the less efficient ones suffer. This implies that more efficient (as measured by Opex Ratio) Retail-NBFCs have lower Rollover Risk compared to less efficient ones.

**Metric 5 – Short-term Liquidity (Cash as a percentage of Borrowings)** - During asset side shocks slowdowns, we expect Retail-NBFCs to find it relatively difficult to raise money from debt mutual funds. If there is a negative asset liability gap in the shorter tenure buckets, an adequate amount of short-term liquidity protects the Retail-NBFC from defaulting on its obligations during real estate shocks or liquidity crunch in debt capital markets. Retail-NBFCs who maintain adequate buffer and do not have asset liability mismatch are able to survive through the stress period as they can meet their obligations without having to tap the wholesale funding market. This implies that they have much lower Rollover Risk.

**Metric 6 – Provisioning Policy** - If the Retail-NBFC is adequately provisioning for loans which it perceives to be sub-standard or doubtful, we would expect Gross NPAs in any year to be lower than provisioning made at the end of the previous year. If it is the other way around, it implies that either defaults were higher than

expected or that the management is not provisioning adequately for earnings management. Provisioning adequately also safeguards the Retail-NBFC if loan defaults spike due to asset side shocks.

**Metric 7 – Capital Adequacy Ratio (CAR)** - As per regulatory norms Retail-NBFCs must hold a minimum of 12% of risk-weighted assets (RWA) in Tier-I and Tier-II capital. Also, Tier-I capital should be a minimum of 8% with Tier-II capital not exceeding 100% of Tier-I capital. Tier-II capital is of lower quality than Tier-I capital due to its composition of assets that are difficult to liquidate. Hence, keeping CAR fixed, Retail-NBFCs with higher levels of Tier-I capital have lower risk of defaulting on its obligations. An adequate level of CAR protects the Retail-NBFC from defaulting on its obligations if there is an asset liability gap in any of the buckets (especially in the shorter tenures).

## **5.2. Health Score Computation**

We assign weights to each of the seven metrics defined in sub-section 5.1. The assigned weights are subjective, and the sum of the weights is 100 points. To capture the relative contributions of each of the metrics to rollover risk, we assign 25 points each to metrics 1 and 2, 20 points to metric 3, 10 points each to metrics 4-5 and 5 points each to metrics 6-7. For each of the fifteen Retail-NBFCs and against each of the metrics 1-7, we compute a score which reflect the relative contribution of that metric towards the rollover risk score for the Retail-NBFC. The maximum possible score for a metric is the weight assigned to that metric (for example, 25 for LDMF sector exposure to CP issued by Retail-NBFCs). We compute the rollover risk scores in each of the financial years from 2014-15 till 2018-19 for each of the fifteen Retail-NBFCs in our sample. We also divide the sample of fifteen Retail-NBFCs into three groups of five firms each based on loan book size to examine

rollover risk within each sub-class. It is important to note that the scores are representative of the average rollover risk of individual Retail-NBFCs in each financial year of the sample period. Mentioned below is a brief description of the scoring methodology for each of the metrics 1 to 7.

**LDMF sector exposure to CP issued by Retail-NBFCs (Metric 1)** - For each (Retail-NBFC)-LDMF pair in our dataset, we extract data on the quantum of CPs issued by the Retail-NBFC that are held by the LDMF – (A) and the Rollover quantum of CP held by the LDMF - (B). This ratio (A/B) is computed every month from April 2014 till March 2019, and we take the average across all months when this ratio was non-zero. We call this the average interlinkage risk for the (Retail-NBFC)-LDMF pair for that financial year. For each financial year, we compute the monthly variance in the ratio, where only months in which the ratio is non-zero goes into the variance computation. We call this the variance in interlinkage risk for the (Retail-NBFC)-LDMF pair for that financial year. The weight assigned to the average interlinkage risk is 18.75 points and the variance in interlinkage risk is 6.25 points for a combined total weight of 25 points assigned to Metric 1. The threshold level of average interlinkage risk and variance in interlinkage risk is computed by taking the average of these measures across all (Retail-NBFC)-LDMF pairs for each of the financial years from 2014-15 till 2018-19. We assign a score of +18.25 to average interlinkage risk for the (Retail-NBFC)-LDMF pair in a year if this value is less than the threshold level of average interlinkage risk and -18.25 otherwise. Similarly, we assign a score of +6.25 to the variance in interlinkage risk for the (Retail-NBFC)-LDMF pair in a year if this value is less than the threshold level of variance in interlinkage risk and -6.25 otherwise. Adding up the scores obtained on average interlinkage risk and variance in interlinkage risk for each (Retail-NBFC)-LDMF pair gives the interlinkage risk for the (Retail-NBFC)-LDMF pair in each

financial year. Each Retail-NBFC in our sample has exposure to at least ten out of fifteen LDMFs. To arrive at the score on Metric 1 for a *specific* Retail-NBFC and the Rollover LDMF sector, we take the average of the interlinkage risk scores obtained for that Retail-NBFC vis-à-vis each of the LDMFs where it had exposure to in that financial year. Higher scores imply lesser Rollover Risk faced by a Retail-NBFC. An example showing the steps involved in computing score on Metric 1 for Mahindra & Mahindra Financial Services in the financial year 2015-16 is shown in Appendix A.

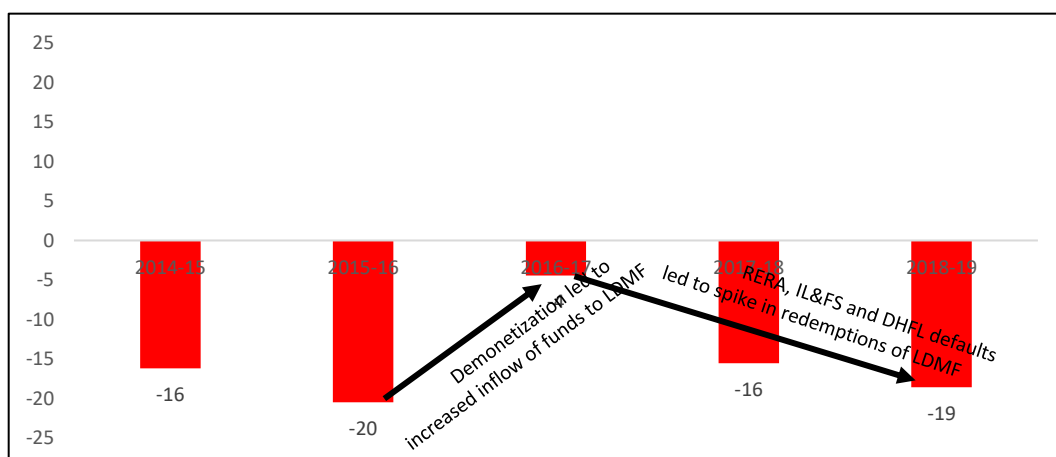
**Liquidity Buffer levels in the LDMF Sector (Metric 2)** - The fifteen LDMFs in our dataset hold three broad classes of investments based on the liquidity risk of the investments. These are classified into highly liquid, moderately liquid and illiquid investments and a brief description of the same is as follows: -

- 1) Highly liquid investments include cash and cash equivalents, G-secs, T-bills, Bills rediscounting and cash management bills. These are the most liquid investments having the lowest liquidity risk investment set of the MFs.
- 2) Moderately liquid investments include certificates of deposits (CDs) and commercial paper (CP).
- 3) Illiquid investments include Corporate Debt (NCDs), Deposits, Floating Rate instruments and PTC/Securitized Debt.

The weight assigned to highly liquid, moderately liquid and illiquid investments are 14, 8 and 3 points respectively for a combined total weight of 25 points assigned to the Metric 2. The average monthly holdings of these three classes of investments are computed for each year from April 2015 till March 2019 which are compared against a threshold level to assign scores based on the investment levels. The

threshold level for highly liquid investments is motivated by the recent SEBI guideline which states that LDMFs must hold a minimum of 20% of these investments, the threshold level for moderately liquid investments is set at 75% and the threshold level for illiquid investments is automatically 5%. We define a range around the threshold level for all three classes of investments, where the LDMF gets assigned the highest score if its holding corresponding to the investment class falls within the range. We also define lower and upper bounds of holdings of the three classes of investments and impose a linear penalty for deviation from the above-mentioned range corresponding to the investment class. The LDMF gets assigned the entire negative weight assigned to that class of investment if its holding lies below the lower bound or above the upper bound corresponding to the investment class. The average of the scores assigned to each of the fifteen LDMF's for Metric 2 in any financial year is the score for Metric 2 in that financial year. The score for Metric 2, thus, ranges between -25 to +25. High scores imply lesser Rollover Risk faced by a Retail-NBFC. An example showing the steps involved in computing the score for Metric 2 for Tata Liquid Fund for the financial year 2016-17 is shown in Appendix B. Figure 10 plots the trends in Metric 2 for the LDMF sector.

**Figure 10: Liquidity Buffer Levels in the LDMF Sector (Metric 2)**



Liquidity Buffer Levels in the LDMF sector is a systemic risk for the Retail-NBFC sector, and the scores do not vary with respect to individual Retail-NBFCs. Liquidity Buffer Levels in the LDMF sector increased significantly in 2016-17 but deteriorated sharply by 2018-19.

### **Threshold level for Metrics 3-5**

For each of the metrics 3-5, we determine an endogenously determined threshold level. The threshold level is determined by taking the average of the values of the metric for all Retail-NBFCs across all years from 2014-15 till 2018-19. For metric 5, we adjust the average downward to arrive at the threshold. Taking the average across Retail-NBFCs and across all years for computing the threshold gives us a reasonable proxy for the rollover risk contribution of the metric for an average risk Retail-NBFC in normal market conditions.

**Short-Term Volatile Capital (Metric 3)** – The threshold level for short-term volatile capital (CP as a percentage of Borrowings) is 12.74%. Rather than imposing a strict threshold, we define a range for the threshold level of short-term volatile capital. In our case, the range selected is 12.74% - 14.65% (we allow 15% deviation from the threshold level on the higher side). We also set an upper bound i.e. the maximum allowed deviation to 19.11% which is 50% higher than the threshold level. If the average level of CP as a percentage of total borrowings for a Retail-NBFC in any year is less than the threshold level of 12.74% or is within the range of 12.74% - 14.65% we assign a score of +20 to the firm for Metric 3. This implies that the short-term volatile capital is low for the Retail-NBFC. If the average level of CP as a percentage of total borrowings for a Retail-NBFC in any year is more than 19.11%, we reckon that the short-term volatile capital for the Retail-NBFC is very high and therefore, assign a score of -20 to the firm for Metric 3. If



the average level of CP as a percentage of total borrowings for a Retail-NBFC in any year is more than 14.65% but less than or equal to 19.11%, we penalize the Retail-NBFC for excessive short-term volatile capital by imposing a linearly declining score as short-term volatile capital goes up from 14.65% to 19.11%. For example, if a Retail-NBFC has CP as a percentage of total borrowings equal to 16.69%, the score assigned is +2 against short-term volatile capital for the firm in that year. Higher scores on Metric 3 imply lesser rollover risk faced by the Retail-NBFC.

**Opex Ratio (Metric 4)** - For each of the fifteen Retail-NBFCs in our sample we extract data on operating expense ratio for the period from April 2014 till March 2019. As the optimum Opex Ratio depends on the scale of the Retail-NBFC, we segregate the fifteen NBFCs into terciles (consisting of five large, medium and small Retail-NBFCs in each tercile). The average Opex Ratio (for our sample) of the large Retail-NBFCs was 4.2%, the medium Retail-NBFCs was 5.1% and the small Retail-NBFCs was 5.3% for the period 2014-2015 till 2018-19. Within each tercile, we compute the average Opex Ratio for the five Retail-NBFCs across the five years which becomes the threshold (optimum) level of Opex Ratio in that tercile. If a Retail-NBFC in a financial year has Opex Ratio less than the threshold level corresponding to the tercile, we assign a score of +10 and -10 otherwise. Higher scores on Metric 4 imply lesser Rollover Risk faced by the Retail-NBFC.

**Short-Term Liquidity (Metric 5)** – The threshold level for Cash as a percentage of Borrowings is 2%. The threshold level is determined by observing the average level of the ratio for all the fifteen Retail-NBFCs in all the years in our sample and then adjusting the average downwards to be more conservative. If a Retail-NBFC, in a financial year, has average level of Cash as a percentage of Borrowings less

than 2%, the score assigned is -10 and +10 if otherwise. Higher scores on Metric 5 imply lesser Rollover Risk faced by the Retail-NBFC.

**Provisioning Policy (Metric 6)** – If the level of provisions (as a percentage of loan book) for a Retail-NBFC as of 31<sup>st</sup> March in any financial year is less than the Gross NPA (as a percentage of loan book) as of 31<sup>st</sup> March of the subsequent financial year, the score assigned is -5 and +5 if otherwise. Higher scores on Metric 6 imply lesser Rollover Risk faced by the Retail-NBFC.

**Capital Adequacy Ratio (Metric 7)** – For each of the fifteen Retail-NBFCs, we observe the average capital adequacy ratio (CAR) in each financial year. The threshold for overall CAR is 16%. We incorporate the higher quality of Tier-I capital by imposing a penalty of -3 to the computed score if Tier-I capital is less than 12%. Hence, we have the following 3 possible computed scores for CAR: -

➤ If  $CAR \geq 16\%$  and Tier-I capital  $\geq 12\%$ , then computed score is 5

➤ If  $CAR \geq 16\%$  and Tier-I capital  $< 12\%$ , then computed score is  $5-3=2$

➤ If  $CAR < 16\%$  and Tier-I capital  $< 12\%$ , then computed score is -5

➤ If  $CAR < 16\%$  and Tier-I capital  $\geq 12\%$ , then computed score is -5

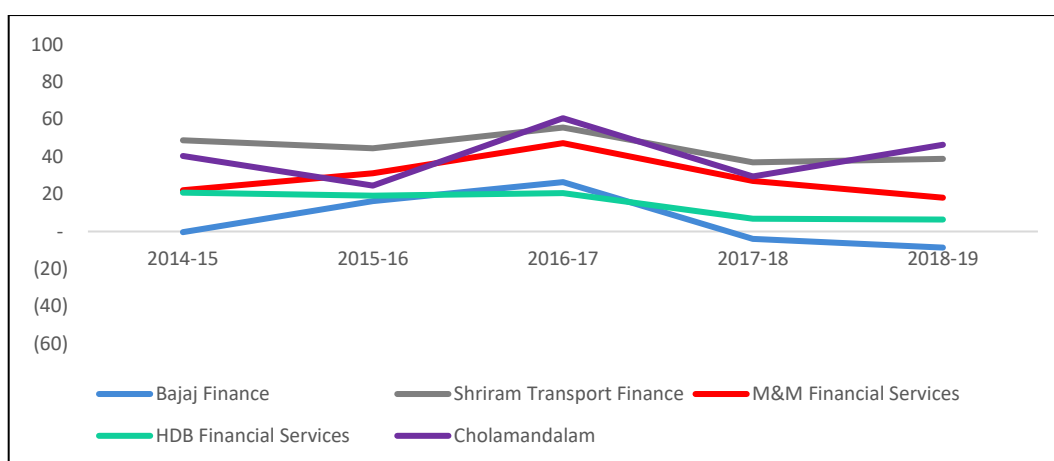
Higher scores on Metric 7 imply lesser Rollover Risk faced by the Retail-NBFC.

After computing the scores of each of the metrics 1-7 for every Retail-NBFC for the financial years 2014-15 till 2018-19, we simply add the scores obtained against each metric to arrive at the Health Score of the Retail-NBFCs. These scores represent the average rollover risk of the Retail-NBFC in each financial year. The Health Score can range from -100 to +100 with higher scores representing lower rollover risk. A

Health Score of 0 is a neutral score, not risky, but not too safe either. We use a benchmark of 50, above which the Retail-NBFC may be deemed sufficiently safe. In Appendix C, we demonstrate the computation of Health Score of Mahindra & Mahindra Financial Services for the financial year 2015-16.

. Figures 11-13 plot the trends in Health Scores for the fifteen Retail-NBFCs classified based on large, medium and small size.

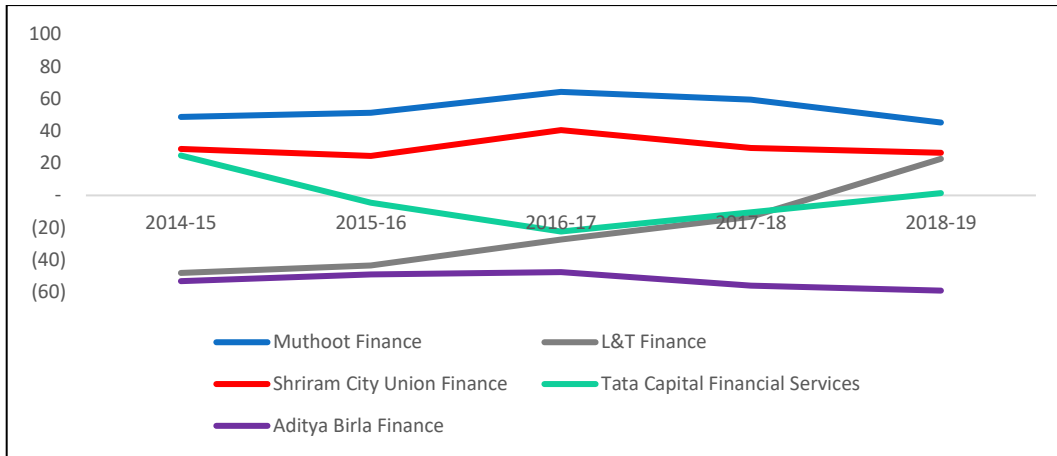
**Figure 11: Health Score – Large Retail-NBFCs**



Source: Annual Reports of Retail-NBFCs (2014-2019)

The five largest NBFCs' are Bajaj Finance, Shriram Transport Finance, Mahindra and Mahindra (M&M) Financial Services, HDB Financial Services and Cholamandalam Investment and Finance. Health Scores for the largest NBFCs' was moderate to average and exhibited low intra-group variation throughout the period.

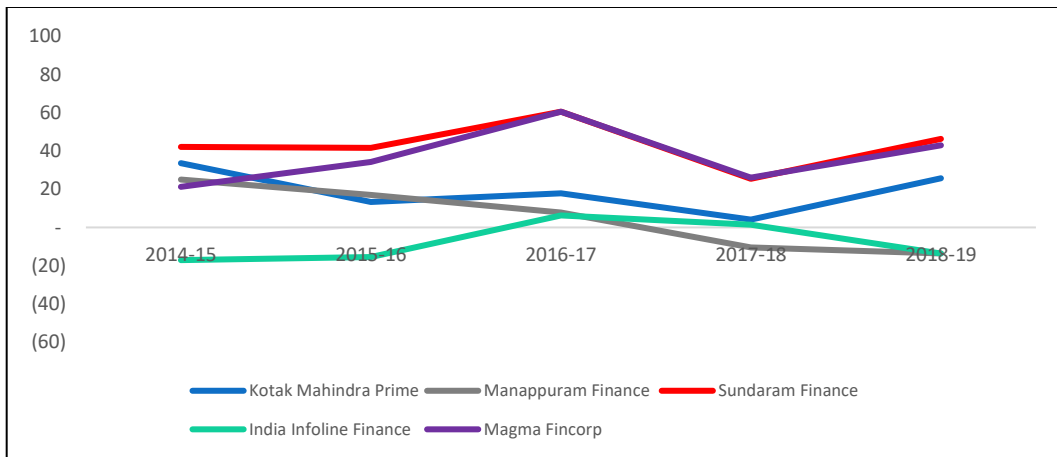
**Figure 12: Health Score – Medium Retail-NBFCs**



Source: Annual Reports of Retail-NBFCs (2014-2019)

The five-medium sized Retail-NBFCs are Muthoot Finance, L&T Finance, Shriram City Union Finance, Tata Capital Financial Services and Aditya Birla Finance. Health Scores for three of the medium sized Retail- NBFCs was low post 2014-15.

**Figure 13: Health Score – Small Retail-NBFCs**

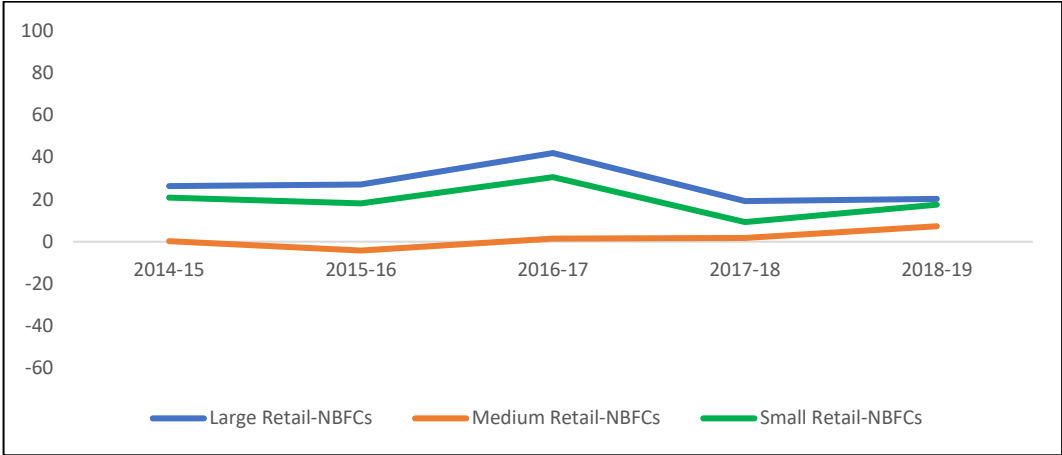


Source: Annual Reports of Retail-NBFCs (2014-2019)

The five smallest Retail-NBFCs are Kotak Mahindra Prime, Manappuram Finance, Sundaram Finance, India Infoline Finance and Magma Fincorp. Health Scores for two of the small sized Retail-NBFCs was low by 2018-19

For each size-based group, we compute the average Health Score of the five firms within the groups. Figure 14 plots the trends in average Health Score for the three size-based groups of Retail-NBFCs.

**Figure 14: Average Health Scores (Retail-NBFCs)**

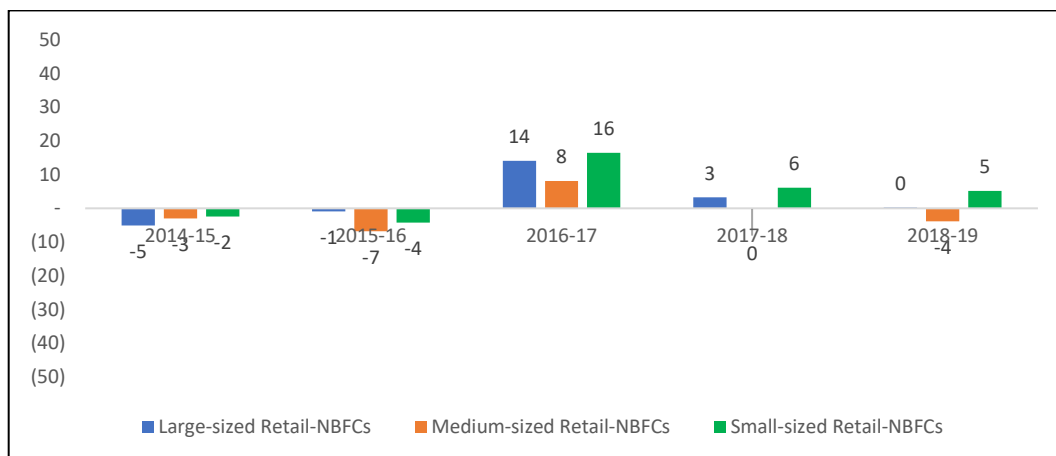


Source: Annual Reports of Retail-NBFCs (2014-2019)

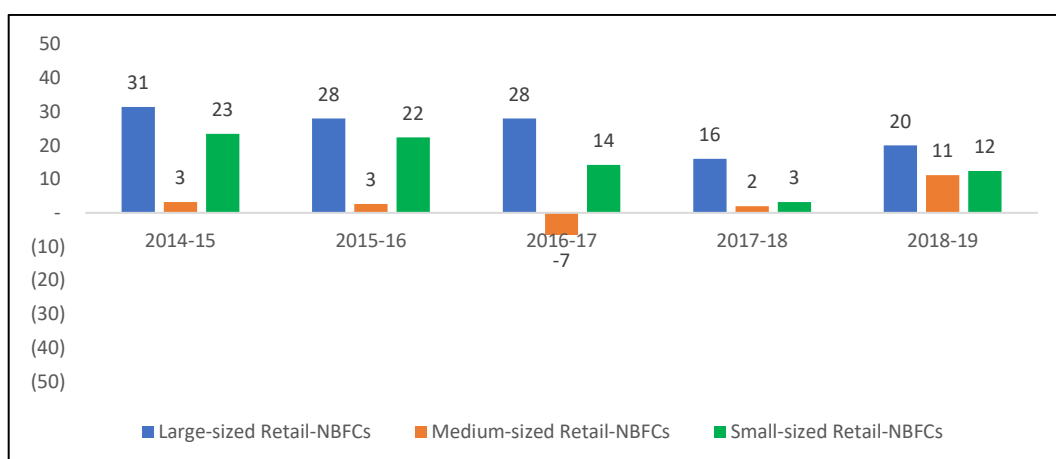
Figure 12 shows that size is not always inversely related to Rollover Risk exposure. Throughout the period, we find evidence that, on average, smaller sized Retail-NBFCs had higher Health Scores than the medium-sized ones. Hence, targetting liquidity enhancements based on size, would be a sub-optimal capital allocation strategy.

Figures 15 and 16 plot the trends in the constituent metrics of the Health Score i.e. Interconnectedness Risk and Financial and Operating Resilience.

**Figure 15: Average Interconnectedness Risk (Retail-NBFCs)**



**Figure 16: Average Financial and Operating Resilience (Retail-NBFCs)**



Source: Annual Reports of Retail-NBFCs (2014-2019)

### 5.3. Predictive Power of Health Score

We attempt to understand whether the rollover risk scores of individual Retail-NBFCs has any predictive power on future abnormal stock returns of these firms. This test is useful in validating the Health Score as an early warning signal.

The annual reports for each financial year are generally released in the period from July to August each year. The dates of release, however, vary for each of the Retail-NBFCs. Information in the annual reports that provide insights on the rollover risk of the Retail-NBFC should gradually reflect in the share price over horizon of a few months as the information is absorbed by active traders. If our

Health Score is a forward-looking measure of the prospects of the Retail-NBFCs, the YoY change in Health Score should explain future abnormal returns of their stocks.

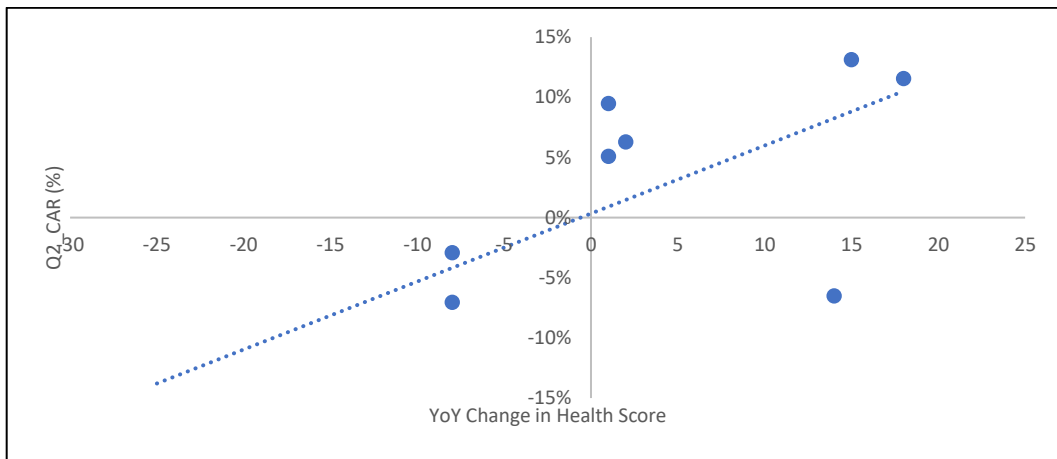
Given the uncertainty of the date of release of annual reports of the Retail-NBFCs and the time required for the information to reflect in future stock price movements/returns of these firms, we estimate the price effect using the cumulative return of an NBFC's stock from July to September (Q2) of each year from 2015 till 2019. We subtract the contemporaneous NIFTY 500 index returns to compute the abnormal returns on a weekly basis. The cumulative abnormal return (Q2\_CAR) is calculated by adding the weekly abnormal returns every week from July to September (~ 12 weeks in a year).

Q2\_CAR is calculated in this way for all the fifteen NBFCs for each year from 2011-2018. We, therefore, obtain a sequence of 5 CAR values for each of the fifteen Retail-NBFCs and corresponding Health Scores of individual Retail-NBFCs. Out of the fifteen Retail-NBFCs classified into three terciles comprising of large, medium and small Retail-NBFCs, 4 out of 5 large Retail-NBFCs, 2 out of 5 medium Retail-NBFCs and 4 out of 5 small Retail-NBFCs are listed on NSE/BSE. We, therefore, construct an equally weighted portfolio of the 4 large Retail-NBFC stocks, 2 medium Retail-NBFC stocks and 4 small Retail-NBFC stocks and compute the CAR for the three portfolios for each of the years from 2015 till 2019. Corresponding to each CAR value for the three portfolios, we have the average rollover risk score of the constituent set of Retail-NBFCs in each of the three portfolios.

Figure 17 shows a scatter plot of Q2\_CAR and YoY Change in Health Scores of the three size-based portfolios. The positively sloped trend line in the scatter plot

confirms our ex-ante expectation that an improvement in the YoY Health Score should result in an increase in future short-term cumulative abnormal returns of the three portfolios.

**Figure 17: Cumulative Abnormal Returns (Q2\_CAR) vs YoY Change in Health Score**



Source: Bloomberg

The scatter plots demonstrate the utility of the Health Score as an early indicator of stress in the Retail-NBFC sector. To further validate its predictive power, we run a “fixed effects” panel regression model (Model I) of Q2\_CAR on YoY change in Health Score of the three size-based Retail-NBFC portfolios.

The regression model (Model I) is specified as follows: -

$$CAR_{i,t} = \beta_0 + \beta_1 \times \Delta Health\ score_{i,t} + \epsilon_i + u_{i,t}$$

where  $i$  denotes the three size-based Retail-NBFC portfolios and  $t$  denotes financial year end.  $\epsilon_i$  is the size-based portfolio “fixed effect” which controls for unobservables such as corporate governance and other factors that might explain future abnormal returns of the Retail-NBFC stocks within the three portfolios and  $u_{i,t}$  is the white noise disturbance term.



We also run an additional “fixed effects” panel regression model (Model II) of Q2\_CAR on YoY change in Health Score of the three size-based Retail-NBFC portfolios and an interaction term of Change in Health Score and IL&FS Defaults. IL&FS Defaults is a dummy variable which is equal to 1 in the period from July to September 2018 and 0 otherwise. The coefficient on the interaction term captures the additional effect on Q2\_CAR of the three portfolios during the period of IL&FS defaults.

The regression model (Model II) is specified as follows: -

$$CAR_{i,t} = \beta_0 + \beta_1 \times \Delta Health Score_{i,t} + \beta_2 \times \Delta Health Score_{i,t} \times IL\&FS\ Defaults + \epsilon_i + u_{i,t}$$

Table 2 reports the results of the estimated regression models.

**Table 2: Regression Results (Q2\_CAR on Change in Health Score)**

Dependent variable is cumulative abnormal returns (Q2\_CAR) and the independent variable is Year-over-Year change in Health Score of the three size-based portfolios in Model I and including the interaction term of change in Health Score and IL&FS Defaults in Model II. Estimation method is “fixed effects” panel estimation in which each portfolio has its own intercept term. The numbers in parenthesis is the standard error of the coefficient estimate.

<b>Regression Results</b>		
	<i>Dependent Variable:</i>	
	Abnormal Returns - (I)	Abnormal Returns - (I)
Change in Health Score	0.006* (0.003)	0.001 (0.005)
Change in Health Score X IL&FS Default		0.009 (0.007)
Observations	12	12
R <sup>2</sup>	37.70%	48.30%
F Statistic	4.848* (df= 1; 8)	3.269* (df= 2; 7)

\*p<0.1; \*\*p<0.05; \*\*\*p<0.01

The estimated fixed effects are positive for large and medium size Retail-NBFC portfolios and negative for small Retail-NBFC portfolio, positive for all three portfolios in Model II. From Model I, we observe that if the change in Health Score

(with respect to the previous financial year) for any portfolio increases by 10 units in any financial year, the Q2\_CAR for the 3-month period from July to September (around the date of release of annual reports) increases by 6 percentage points which is economically significant. The coefficient ( $\beta_1$ ) of the Year-over-Year change in Rollover Risk score is also statistically significant at 10% level of significance.

From Model II, we observe that if the change in Health Score for any portfolio increases by 10 units for any financial year, the Q2\_CAR for the 3-month period from July to September (around the date of release of annual reports) increases by 1 percentage points and by 10 percentage points ( $\beta_1 + \beta_2$ ) around the period of IL&FS defaults (i.e. July to September 2019). The signs of  $\beta_1$  and  $\beta_2$  are also consistent with ex-ante expectations that increase in Health Score (reduced Rollover Risk) leads to future positive abnormal returns.

We have limited number of observations (12) for the dependent and independent variable and we estimate 5 coefficients including 3 portfolio “fixed effects”. The degrees of freedom for our regression model is low (8). Hence, 10% level of statistical significance of  $\beta_1$  suggests that change in Health Score is a strong predictor of future abnormal returns of the Retail-NBFC portfolios. Typically, when the number of independent variables is large compared to total number of observations, principal component analysis (PCA) is a way around the high dimension regression problem (multicollinearity). PCA essentially computes a linear combination of the independent variables which becomes the new independent variable. This reduces the number of independent variables to one variable and results in higher degree of freedom of the regression model. Our rollover risk score computation is intuitively like PCA, where we combine information on the seven metrics (7 independent variables) some or all of which

may individually explain future abnormal returns. By combining the seven independent variables and replacing them by a single independent variable (rollover risk score), we save some degrees of freedom which makes it easier to detect significant relationships. For robustness, we also run a “fixed effects” panel regression model of Q2\_CAR on Health Score for all the three size-based portfolios. The second model also reports positive sign on  $\beta_1$ , which is consistent with our main model. The results are listed in Appendix D.

## **6. CONCLUSION**

This article investigates the key drivers of Rollover Risk of the Retail-NBFC sector in India motivated by the current liquidity crunch faced by the shadow banking system. The above analysis suggests that firms in the Retail-NBFC sector are susceptible to Rollover Risk when they rely too much on the on the short-term wholesale funding market for financing their investments in the real sector.

Using a novel scoring methodology, we quantify the Rollover Risk for a sample of Retail-NBFCs which are representative of the Retail-NBFC sector. The Health Score of the Retail-NBFC sector was consistently below par for the period 2014 till 2019. Larger Retail-NBFCs had higher Health Scores but among medium and small Retail-NBFCs, the medium size ones had a lower Health Score for the entire period from March 2014 till March 2019. The above findings suggest that the Health Score provides an early warning signal of impending liquidity problems. We find significant evidence that equity markets react favourably to increase in Health Score of the Retail-NBFC portfolios, thereby confirming the ability of Health Scores to predict stress in the sector.

Our analysis provides a dynamic leading indicator of the financial health of firms in the NBFC sector, after incorporating the macroprudential externalities of their investment and financing decisions. Regulators can employ the Health Score to detect early warning signals of impending Rollover Risk problems in individual Retail-NBFCs. Downtrends in the Health Score can be used to trigger greater monitoring of the Retail-NBFC. Furthermore, an analysis of the trends in the components of the Health Score can shed light on the appropriate corrective measures that should be applied to reverse the adverse trends. Policy makers intending to revive the shadow banking channel of growth can use this analysis to efficiently allocate liquidity enhancements across firms (with different Health Scores) in the Retail-NBFC sector, thereby arresting financial fragility in a capital-efficient manner.

## **APPENDIX A**

### **LDMF sector exposure to CP issued by Retail-NBFCs (Metric 1) - Computation for Mahindra & Mahindra Financial Services for the financial year 2015-16**

The threshold level of average interlinkage risk and variance in interlinkage risk based on data on fifteen Retail-NBFCs and fifteen LDMFs are 3.39% and 0.069% respectively. Table 3 is a snapshot of the data for Mahindra and Mahindra (M&M) Financial Services in the financial year 2015-16.

**Table 3: LDMF Sector exposure to CP issued by M&M Financial Services**

M&M LDMF Sector Exposure- 2015-2016					
LDMF	Average [CP issued by M&M (A)/Total CP held by LDMF (B)]	Score - Average Interlinkage Risk	Monthly Variance in A/B	Score - Monthly Variance in A/B	Total Score
Aditya Birla SL Liquid Fund(G)	3.72%	-18.75	0.0511%	6.25	-13
Axis Liquid Fund(G)	0.13%	18.75	0.0000%	6.25	25
DSP Liquidity Fund-Reg(G)		18.75		6.25	25
Franklin India Liquid Fund-Super Inst(G)	6.50%	-18.75	0.0202%	6.25	-13
HDFC Liquid Fund(G)	4.45%	-18.75	0.0374%	6.25	-13
ICICI Pru Liquid Fund(G)	2.43%	18.75	0.0225%	6.25	25
IDFC Cash Fund-Reg(G)	3.16%	18.75	0.0691%	-6.25	13
Kotak Liquid Fund-Reg(G)	4.40%	-18.75	0.0476%	6.25	-13
L&T Liquid Fund(G)	4.62%	-18.75	0.0322%	6.25	-13
LIC MF Liquid(G)	2.25%	18.75	0.0012%	6.25	25
Reliance Liquid Fund(G)	2.38%	18.75	0.0231%	6.25	25
SBI Liquid Fund(G)	1.90%	18.75	0.0006%	6.25	25
Sundaram Money Fund-Reg(G)	0.45%	18.75	0.0007%	6.25	25
Tata Liquid Fund-Reg(G)	2.57%	18.75	0.0000%	6.25	25
UTI Liquid Cash Plan-Reg(G)	3.34%	18.75	0.0006%	6.25	25
<b>LDMF Sector Exposure to CP issued by M&amp;M (Metric 1) score</b>					<b>12</b>

For each M&M- LDMF pair, we assign a score of +18.75 to the interlinkage risk if the value is less than or equal to 3.39% and -18.75 otherwise. For each M&M-LDMF pair, we assign a score of +6.25 to the monthly variance in interlinkage risk if the value is less than or equal to 0.069% and -6.25 otherwise. The scores obtained on interlinkage risk and variance in interlinkage risk for each M&M-LDMF pair is shown in columns 3 and 5 in Table 3. The sum of these scores is shown in column 6 which are then averaged across all M&M-LDMF pairs (last row of Table 3).

*Thus, the total score assigned to M&M for Metric 1 in 2015-16 is +12 points out of 25 points as illustrated in Table 3.*

## APPENDIX B

### Liquidity Buffer levels in the LDMF Sector (Metric 2) – Computation for Tata Liquid Fund for the financial year 2016-17

Tata Liquid Fund (TLF) had average highly liquid investments of 15.06%, moderately liquid investments of 75.50% and illiquid investments of 9.44% in financial year 2016-17.

Score for highly liquid investments of TLF

The range in which TLF gets 14 points for highly liquid investments is 18% to 22%. From 13% till 18% the score assigned linearly increases from -14 to +14 with each percentage point worth 5.6 points. From 18% till 27% the score assigned linearly decreases from +14 to -14 with each percentage point worth 5.6 points. As

TLF's highly liquid investments is 15.06%, the score assigned for this class of investments for 2016-17 is  $[-20 + (15.06\% - 13\%) \times 5.6 = -2.495]$  points which is rounded to -2

Score for moderately liquid investments of TLF

The range in which TLF gets 8 points for moderately liquid investments is 73% to 77%. From 68% till 73% the score assigned linearly increases from -8 to +8 with each percentage point worth 3.2 points. From 77% till 82% the score assigned linearly decreases from +8 to -8 with each percentage point worth 3.2 points. As TLF's moderately liquid investments is 75.50%, the score assigned for this class of investments for 2016-17 is +8 points.

Score for illiquid investments of TLF

The range in which TLF gets 3 points for illiquid investments is 1% to 9% which gets automatically decided by the ranges of highly liquid and moderately liquid investments as the sum of the three classes of investments must be 100%. If illiquid investments is within the range from 1%-9%, the LDMF gets +3 points and -3 otherwise. As TLF's illiquid investments is 9.44%, the score assigned for this class of investments for 2016-17 is -3 points.

*Thus the total score assigned to TLF for Metric 2 in 2016-17 is  $-2+8-3 = 3$  points out of 25 points. The scores for Metric 2 is computed similarly for all the fifteen LDMFs in our sample and averaged to compute the score for Metric 2 for the LDMF sector in 2016-17. This procedure is replicated for each of the financial years from 2014 till 2019.*

## **APPENDIX C**

### **Health Score Computation of Mahindra and Mahindra (M&M) Financial Services for the financial year 2015-16**

As shown in Appendix A, the score for Metric 1 assigned to M&M is +12 points.

The score obtained for Metric 2 for the financial year 2015-16 is computed according to the methodology illustrated in Appendix B. The score for Metric 2 assigned to M&M is -20 points as shown in Figure 8 in sub-section 5.2.

The average level of Commercial Paper as a percentage of Borrowings (Metric 3) for M&M in the financial year 2015-16 was 14.18% which is within the range of 12.74% - 14.65%. Hence, the score for Metric 3 assigned to M&M is +20 points.

Opex Ratio (Metric 4) for M&M (large-sized Retail-NBFC) in the financial year 2015-16 was 3.39% which is lesser than the threshold Opex Ratio of 4.18% for large-sized Retail-NBFCs. Hence, the score for Metric 4 assigned to M&M is +10 points.

The average level of Cash as a percentage of Borrowings (Metric 5) for M&M in the financial year 2015-16 was 2.40% which is greater than the threshold of 2%. Hence, the score for Metric 5 assigned to M&M is +10 points.

The level of provisions (as a percentage of loan book) for M&M as of 31<sup>st</sup> March 2015 was 2.93% which was lesser than the Gross NPA (as a percentage of loan book) of 8.79% as of 31<sup>st</sup> March 2016. Hence, the score for Metric 6 assigned to M&M is -5 points.

Average Capital Adequacy Ratio (Metric 7) for M&M in the financial year 2015-16 was 17.80% which is greater than the threshold of 16%. Moreover, the share of Tier-I capital was 15.05% which is less than the threshold of 12%. Hence, the score for Metric 7 assigned to M&M is +5 points.

*Thus, the Health Score for M&M Financial Services in the financial year 2015-16 is the sum of the scores for Metrics 1-7 which is equal to +12-20+20+10+10-5+5 = +31 points.*

## APPENDIX D

### Results of an additional panel regression model

**Table 4: Regression Results (Q2\_CAR on Health Score)**

Dependent variable is cumulative abnormal returns (Q2\_CAR) and the independent variable is the Health Score of the three size-based portfolios in Model I and including the interaction term of change in Health Score and IL&FS Defaults in Model II. Estimation method is “fixed effects” panel estimation in which each portfolio has its own intercept term. The numbers in parenthesis is the standard error of the coefficient estimate.

Regression Results		
	Dependent Variable:	
	Abnormal Returns - (I)	Abnormal Returns - (I)
Health Score	0.006 (0.004)	0.006 (0.004)
Health Score X IL&FS Default		-0.004 (0.002)
Observations	15	15
R <sup>2</sup>	19.80%	37.90%
F Statistic	2.717 (df= 1; 11)	3.052* (df= 2; 10)

\*p<0.1; \*\*p<0.05; \*\*\*p<0.01

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