Analysis

# How was liquidity transformation in investment funds measured?

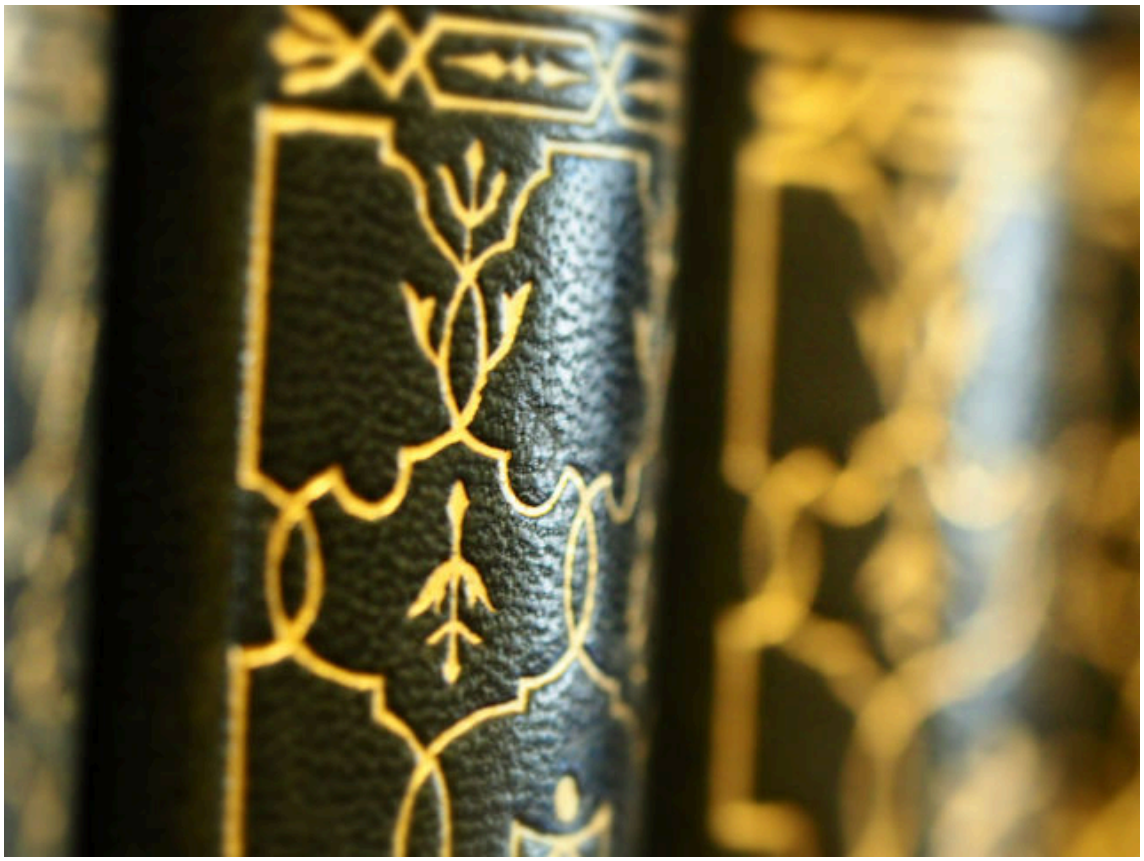
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This appendix describes the method applied, the results of which are reported in the article 'Investment funds have grown significantly in Finland – do their operations involve stability risks?'



There is no single unambiguously correct manner of measuring liquidity transformation as performed by investment funds. Central to such an analysis is the quality of the available data on

the liquidity of fund holdings of investment assets and the liquidity of their fund-share liabilities.

The present examination was based on fund-level data serving as the basis for the Bank of Finland's investment fund statistics and on data derived from the Financial Supervisory Authority's AIFMD data collection. The latter includes information reported by Finnish alternative investment funds[1] covered by the AIFM Directive, on the days required for the redemption of their fund shares (on the basis of the fund rules), and fund managers' estimates of the number of days required for the conversion of their investment assets into cash.

Each fund's fund-share liabilities and investment assets are divided into seven classes[2] that can be considered to represent distributions of the liquidity structures of the fund's fund-share liabilities and investment assets. These can also be seen as probability distributions. One can consider, in particular, that the *redeemability of fund-share liabilities* reflects the probability distribution of the liquidity of fund liabilities and that the *convertibility into cash of investment assets* reflects the probability distribution of the liquidity of fund assets.

Firstly, in respect of each fund F, expectation values were defined for days needed for fund-share redemption $D_L$ as follows:

Here $p_{F,i}$ is the percentage of fund-share liabilities included in class i of fund F and $d_i$ is the average of the extremes of class i reflecting the days required for redemption (e.g. in class 2 this is (2+7)/2 = 4.5).

The obtained expectation value for the liabilities side can also be placed in any of the seven classes in connection with a corresponding classification for the assets side. Consequently, **the value of assets exposed to liquidity transformation was defined so as to equal the sum of assets defined for classes higher (containing more illiquid items) than the class of the expectation value for the redeemability of fund-share liabilities**.

Meanwhile, the strength of liquidity transformation was gauged by first defining expectation values in terms of days ($E(D_{A,F})$) for the convertibility into cash of investment assets exposed to liquidity transformation, in the same way as in the case of fund-share liabilities.

This enabled calculation of a 'liquidity gap' measuring the difference in days between the

redeemability of fund-share liabilities and the convertibility into cash of investment assets:

The values obtained were placed into six classes[3] reflecting the strength of liquidity transformation and used in reporting the results.

Given that the AIFMD data collection does not cover investment funds subject to the UCITS Directive, money market funds and some private equity funds, it was necessary to estimate liquidity distributions of assets and liabilities for these separately. The information employed here was derived from the Bank of Finland's fund-level statistics, which contain extensive security-specific data on assets and liabilities of investment funds.

The assets included in the analysis were first grouped into seven liquidity categories based on their instrument, sector and country codes.[4]

Expectation values for the redeemability of fund-share liabilities of funds other than AIFs were, in turn, defined on the basis of a rough fund classification.[5] In this context, the highest degree of uncertainty relates to the value defined for redeemability regarding private equity funds.

After expectation values had been established for the redeemability of fund-share liabilities and for the convertibility into cash of investment assets, the remaining funds could otherwise be analysed in accordance with the method used in the case of AIFs. Calculations for AIFs were performed using both information derived from the AIFMD data collection and information on liquidity distributions of assets, based on the grouping made for the analysis. The latter calculation method gave a EUR 1.8 billion higher amount for assets exposed to liquidity transformation.

The liquidity defined for an asset in the latter method is linked to the security's classification data. In reality, however, asset liquidity is often not necessarily a static feature of security classes so defined or even of an individual security. In practice, the liquidity of a security can vary according to the timing of sales, the market situation and the size of the saleable lot. For this reason, the results based on our method should be deemed at best indicative.

## Notes

1. Alternative investment funds are statistically classified into non-UCITS or private equity ↑

funds.

2. The values were divided into classes as follows: 1. no more than 1 day, 2. 2–7 days, 3. 8–30 days, 4. 31–90 days, 5. 91–180 days, 6. 181–365 days, and 7. more than 365 days. ↑
3. 1. no more than 7 days, 2. 8–30 days, 3. 31–90 days, 4. 91–180 days, 5. 181–365 days and 6. more than 365 days. ↑
4. Category 1: Cash and deposits, money market instruments, bonds and derivatives issued by residents of core countries (Australia, Austria, Belgium, Canada, Denmark, Finland, France, Germany, Ireland, Italy, Japan, Netherlands, New Zealand, Norway, Portugal, Spain, Sweden, Switzerland, United Kingdom, United States) and international organisations. Category 2: Listed shares, bonds and derivatives issued by non-core country residents; fund shares, fixed-term and repo deposits and other financial assets in core countries. Category 3: Fixed-term and repo deposits and other financial assets in non-core countries. Category 4: Direct loans to residents of core countries. Category 5: Fund shares and loans of investment funds resident in non-core countries. Category 6: Unlisted shares of core country residents. Category 7: Unlisted shares, fixed and other real property of non-core country residents. In classifying the information, use was made of reference data received from the AIFMD data collection. After classification, it was possible to calculate expectation values for the convertibility into cash of fund-specific assets, in the same way as above for alternative investment funds (AIFs). ↑
5. Money market funds: 1 day, UCITS investment funds: 4 days, private equity funds: 365 days, and others: 19 days. ↑

## Keywords

financial stability, investment funds, shadow banking