

Liquidity Risk Management for Investment Funds.

The Importance of Asset & Liability liquidity management at Management Company level.

Three years after the implementation of the Alternative Investment Fund Management Directive (AIFMD) at EU Member States level, this paper describes the solution implemented by BIL Manage Invest to address liquidity management requirements.

We believe that the advanced academic background together with the comprehensive and clear presentation of results exceeds regulatory expectations and can be an asset for small & medium Management Companies, Investment Managers, Independent Board Members or Conducting Officers.

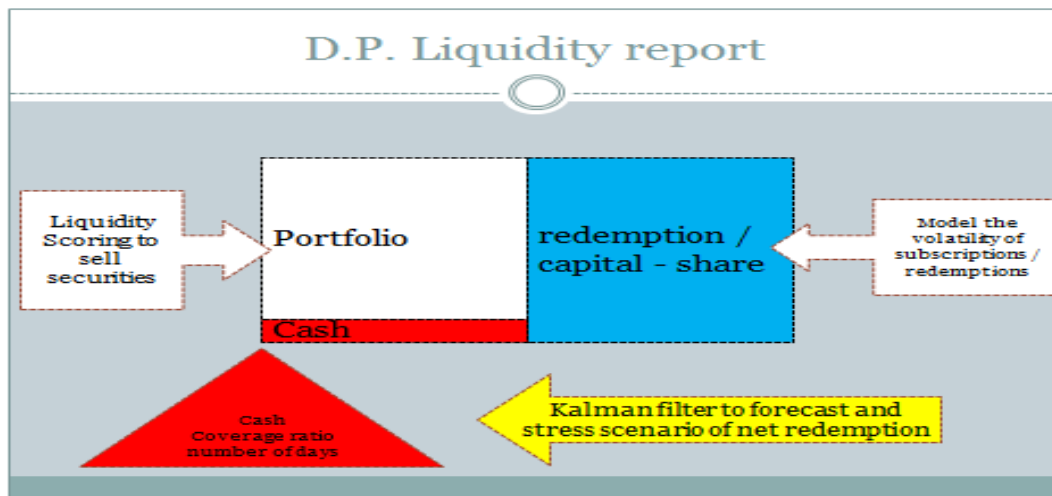


Alain Bastin

Alain Bastin, Chief Executive Officer of BIL Manage Invest & Board Member of ALRIM, is proud to announce the launch of its new Liquidity Risk Management platform, developed in partnership with D.CONCONSULTING a FinTech firm, which provides new technological and academic/scientific methodologies on liquid & illiquid financial

products. The strength of D.Consulting is to propose the latest public scientific solution in Risk Management and to make them quickly applicable to real financial life. The partnership with D.CONSULTING really gives us a competitive advantage in the field of Liquidity Risk Management oversight. This platform can serve not only our existing clients but also externals by insourcing liquidity risk measurements for small & medium Management Companies who want to increase their liquidity risk oversight.

Based on an Asset & Liability management approach, our solution produces the optimal liquidity cost to liquidate the positions of the fund within a fixed period of time. This approach can also be seen as a liquidity adjusted Value at Risk.



The combination of liquidity scale of portfolio (asset scoring) with the volatility of the investor behavior and the optimal time to liquidate allows us to create a new generation of liquidity risk report, that will give value not only to Risk Managers in their oversight role but also to Portfolio Managers who will be able to quantify the impact of a trading strategy on the potential expected liquidity cost of trading over a fixed period of time.

Asset & Liability report with optimal day to liquidate

STRESS 99% View

Rating	Cash	1	2	3 and more
Portofolio asset amount	1 365 489	31 153 670	6 361 901	3 291 961
Liability profil with stress 99% scenario	1 600 580	37 875 187	3 595 558	4 358 145
Optimal time to liquidate	0-1 days	2-4 days	5-10 days	11-24 days and more
Static gap	-215 090	-6 721 516	2 766 346	-1 066 183
Cumulative gap	-215 090	-6 936 606	-4 170 263	-5 236 446
Non optimality liquidity expected loss	0	-110 985	-66 724	-83 783
Global non optimal liquidity cost	-316 318			

For the first time in risk management the sum of non optimal liquidity cost

The optimal date to liquidate securities with rating 1 (very liquid) is between 2 and 4 days

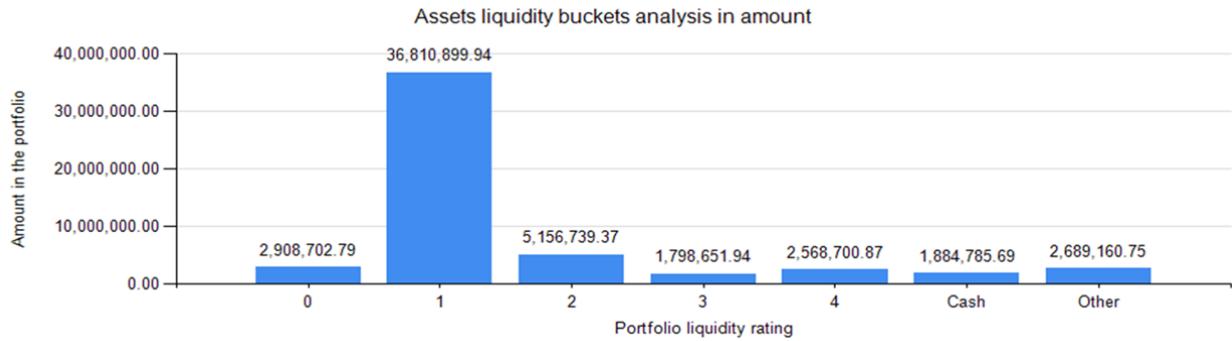
The available cash selling the high liquidity portfolio (rating 1) is 31 153 670 € but the liability redemption is more with 37 875 187 € according to the stress scenario 99%. We have to sale the rating 2 before its optimal date 5-10 days and have to accept additional liquidity cost 110 985 €

In order to be able to produce this Asset & Liability management approach, the asset (equities, bonds..., and cash) and liability (funds shares subscriptions) dimensions have to be managed at any time of the life of the fund.

On the assets side, the objective is to limit the risk that a position in the fund cannot be sold, liquidated or closed at limited cost in an adequately short time frame. We then have to calculate the liquidity risk scale for each individuals positions of the portfolio.

Two new scoring methods have been implemented.

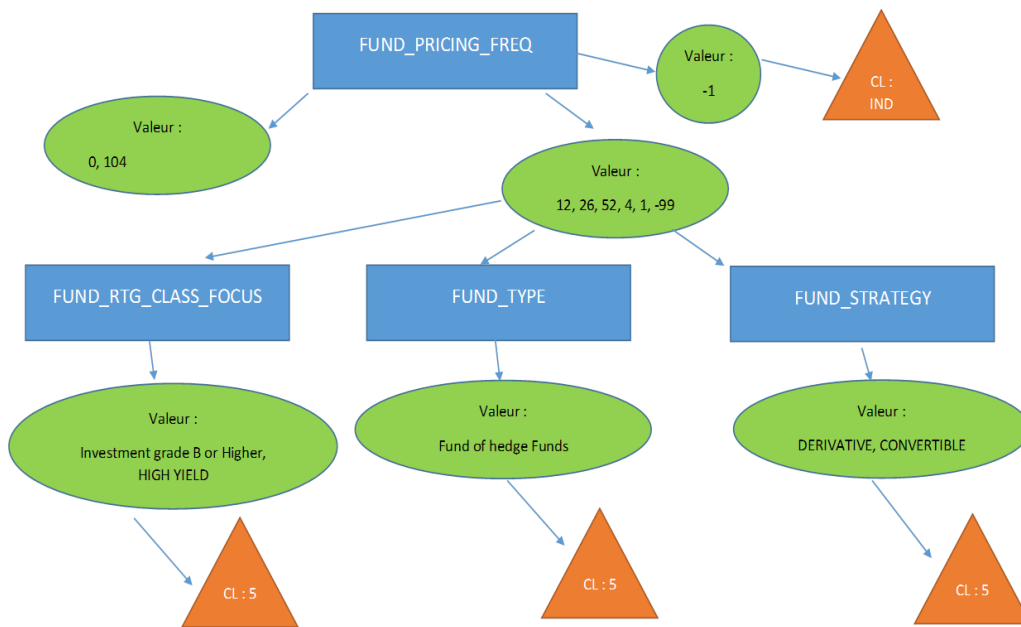
The first one for bond, loans and equities is based on a logistic regression with synthetic indicators issued of financial literature.



This calculation is based on the combination of 12 liquidity indicators that together will represent the asset liquidity rating.

- ✓ The Average Bid - Ask
- ✓ The Low stress Bid - Ask
- ✓ The High Stress Bid - Ask
- ✓ The number of contributors
- ✓ The Kyles'Lambda (elasticity relation between market prices and volumes)
- ✓ The Intraday resilience (the return to normal conditions after a temporary deviation)
- ✓ Market efficiency coefficient (measure the liquidity adjusted for the effects of price volatility due to the general running of the markets)
- ✓ Days to liquidate
- ✓ Volume Distribution
- ✓ Le Saout synthetic Liquidity indicator (VTP indicator) (liquidity indicator that takes into account both volume size, price and time).
- ✓ The LOT indicator, in reference to the L.O.T (Lesmond, Ogden, Trzcinka, 1999) model (Indicator that will link the liquidity to the transactions costs).

The second, is a recursive partitioning method to score the liquidity of funds. Indeed, it is not possible to calculate only quantitative indicators on fund. The level of liquidity is appreciated from quantitative and qualitative information's of contractual type (frequency of N.A.V. - type of management...). Recursive partitioning is a decision tree that allows to qualify the level of liquidity based on the contractual information.



On the Liability side, we have to take into account the subscriptions / redemptions process. The objective is to model the investors' behaviour to reasonably forecast the potential future needs of liquidity.

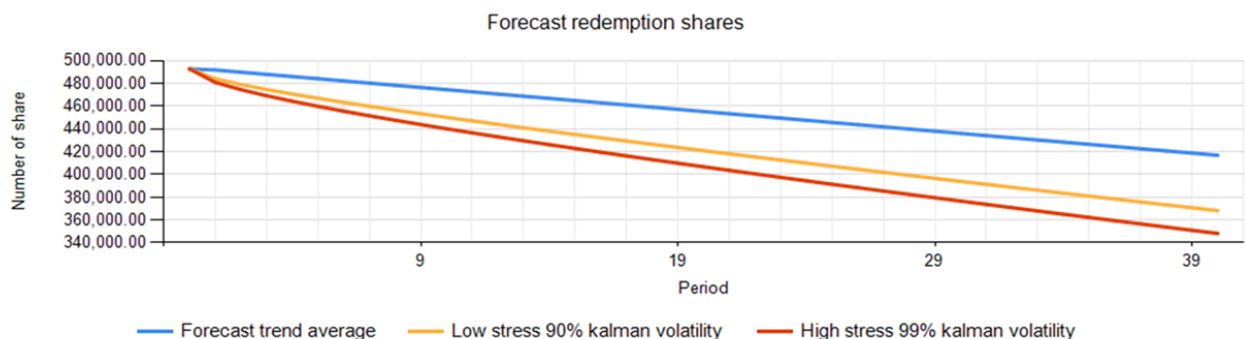
Based on the historical trend of number of shares, we define a potential average trend and stressed trends. We link it then to the cash level of the Fund and define the numbers of days the Fund will "survive" (to be understood as the capacity to pay redemption before starting to sell securities) to redemption demands.

The methodological approach is based on the Kalman filtering, which is a mathematical algorithm that uses a series of measurements observed over time, containing statistical noise (to define stress test) and other inaccuracies (measure of NAV), and produces estimates of unknown variables that tend to be more precise than those based on single

measurement as ARIMA ARCH GARCH model. The Kalman filter has numerous applications in technology. The algorithm works in a two-step process. In the prediction step, the Kalman filter produces estimates of the current state variables, along with their uncertainties. Once the outcome of the next measurement (necessarily corrupted with some amount of error, including random noise) is observed, these estimates are updated using a weighted average, with more weight being given to estimates with higher certainty. The algorithm is recursive. It can run in real time, using only the present input measurements and the previously calculated state and its uncertainty matrix; no additional past information is required.

With Kalman we have trend forecast of share and stress scenario with statistical level.

We link these stressed trends to the Fund cash amount currently available to determine how long the proceeds will not affect the portfolio.



Due to the liquidity shortfalls during the 2008 financial markets crisis some funds were forced to suspend the redemption of fund units, including UCITS. Regulatory measures have consequently been introduced at the European level. The 2009/65/EC UCITS IV Directive (transposed in Luxembourg in both the Regulation CSSF 10-4 and the CSSF circular 11/512) for the first time contained the requirements to monitor the liquidity of funds.

In a second step, Directive 2011/ 61/EU on Alternative Investment Fund Managers (AIFMD) implemented by EU Member States on 22 July 2013 has adopted strong requirements in respect of liquidity management.

Our new solution gives a global and possible response to the financial and prudential regulation. This platform can serve not only our existing clients but also external actors who would have needs in independent liquidity risk measurements and oversight.

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