

IBM Algo Liquidity Risk solution guide

*Evolving best practice and regulations
for proper liquidity risk*



Contents

- 2 Liquidity Risk: It is important now
- 4 Algo Liquidity Risk — functional overview
- 10 Algo Liquidity Risk — technical overview
- 10 Technical architecture
- 12 Deployment
- 14 Algo Liquidity Risk functionalities
- 16 Key benefits
- 18 Additional resources
- 18 About Business Analytics

Liquidity risk: It is important now

In spite of being one of the most typical risks embedded at the core of banking activity, liquidity risk had received only a minor amount of attention and resources for many years. A long period of abundant liquidity contributed to this risk type attracting only modest attention in comparison to others. The subprime crisis in 2007 reminded financial institutions that, however rare and unlikely it might be, failing to properly address it can critically expose them.

A fundamental assumption that had been commonly accepted over at least two decades proved completely wrong: namely, that a bank would always be offered liquidity with fair terms up to virtually any amount, provided it could show good asset quality. A consequence of this assumption was that many banks only looked at the asset side of the balance sheet. The liquidity shortage since 2007 has shown that the equilibrium between assets and liabilities needs to be preserved at all times, including when unusual situations generate liquidity strains. A new awareness has been spreading that even if liquidity risk is inherently connected to the banking activity (namely, to the transformation of maturities) it needs to be kept below limits, and controlled such that the probability of defaulting even in extreme circumstances is substantially reduced.

Proper liquidity risk is managed on a projected cash flow basis and this requires stress testing as a key feature for a success. Scenarios such as “Business As Usual,” “Bank-specific crisis” and “General Market crisis” are critical to evaluating cash flow requirements and to set cash flow mismatch limits in order to limit a bank’s liquidity exposure. In addition, liquidity contingency funding plans and early warning indicators should be in place in order to avoid future liquidity crisis.

Any bank that has a low appetite for liquidity risk needs to consider a list of key principles, such as:

- Certify that all cash flow obligations in the immediate term can be covered through the maintenance of high quality liquid assets that can support day-to-day operations
- Meet Survival Horizons under a range of specific and general market liquidity stress scenarios in order to meet cash flow obligations both short term and medium term
- Prepare and maintain daily senior management liquidity reports and scenario analysis
- Be prepared to submit regulatory information on a daily basis
- Ensure the liquidity risk management framework is compatible with both local and international regulators
- Establish detailed contingency plans that can cover the institution in a liquidity crisis event

In general a key component of the liquidity framework is scenario modeling. The basic scenarios that need to be considered are:

- *“Going-concern”*: captures the “Business As Usual (“BAU”)” behavior of cash flows
- *“Name-crisis”*: captures the behavior of cash flows during a potential name-specific liquidity crisis where there might be operational issues, solvency concerns of the bank or adverse rating changes
- *“Survival Horizons”*: it is important to differentiate between stressed and normal market conditions in a name-specific crisis

Finally, institutions are required to comply with both local and regulatory liquidity requirements which are still evolving at the moment.

IBM® Algo® Liquidity Risk has been designed to offer robust support for the thoroughly revised and substantially overhauled guidelines for best practice. A list of the benchmark documents that have been published is available in the references.

From a regulatory point of view, funding liquidity risk is not subject to regulatory capital requirements under Basel II Pillar 1. Liquidity risk is considered under Pillar 1 only for the Incremental Risk Charge which is required for illiquid assets. Funding liquidity risk instead is addressed under Pillar 2 as part of the Internal Capital Adequacy Assessment Process (ICAAP), and indeed Market Liquidity Risk is addressed in the Individual Liquidity Adequacy Assessment (ILAA), but there is no commonly accepted methodology for the calculation of internal capital for this risk type. This is due to funding liquidity risk not lending itself to being measured and mitigated with value-based indicators, including capital. It is measured by means of cash flows occurring at defined points in time, which cannot be “swapped” against an opposite cash flows occurring at a different time. Capital is not a suitable mitigant for it, nor is any value-based measure.

The Basel Committee on Banking Supervision (BCBS) issued its paper “Basel III: International framework for liquidity risk measurements, standards and monitoring” (Dec 2010) after a lengthy consultation period. Two key ratios take center stage. The Liquidity Coverage Ratio (LCR) requires that net cash outflows expected over a 30 day period are at least equaled by liquid asset holdings. The Net Stable Funding Ratio (NSFR), requires that the amount of funding available with a maturity of one year or more at least equal the amount of funding expected to be required beyond one year as a result of maturing assets or contingent liabilities. Both ratios should be calculated with standard coefficients that reflect predefined stress assumptions.

The regulatory environment for liquidity risk is subject to a substantial change worldwide and will be much more stringent than in the past. A number of local supervisors have already announced a revision of their liquidity risk regimes. Prominent among them is the U.K.’s Financial Services Authority (FSA), having assigned a key priority to liquidity risk: “The international competitiveness of U.K. firms is dependent on strong liquidity regulation.” And “... many institutions will need to significantly reshape their business model over the next few years as a result (of the new supervisory regime).”

The effort to overhaul supervision of liquidity risk is being undertaken internationally. Local supervisors, including Canada (OSFI), the US with the liquidity requirements of its three agencies (Federal Reserve, Office of the Comptroller of the Currency and Federal Deposit Insurance Corporation), Germany (BAFIN), China (China Banking Regulatory Commission - CBRC) and many more have enforced “Super Compliance.” That is, they have implemented regulations that are going further than the Basel III Accord and BCBS recommends.

Although IBM does not expect the current differentiation in local approaches to be completely removed, There is a process whereby a number of elements are increasingly accepted as key for sound liquidity risk management. The topics that are being stringently addressed in all revisions to local liquidity risk regimes and for which, as described in the next section, Algo Liquidity Risk provides state-of-the-art liquidity risk management functions are:

- Reliability of data infrastructure, including comprehensiveness and accuracy
- Stress testing
- Integration of Funding Liquidity Risk with Market Liquidity Risk
- Survival Horizons
- Measuring the Liquidity Risk Spread Term Structure
- Dynamic Simulations of Future Business
- Risk policies/contingency funding plans

Algo Liquidity Risk — functional overview

Algo Liquidity Risk is a set of state-of-the-art specialized technology capabilities integrated in a dataflow that is designed for high performance.

IBM has devoted substantial efforts to coupling advanced functionalities and usability. In order to enhance usability, IBM provides an easy-to-use graphical user interface in order to keep complexity as much as possible behind the scenes and make it available for a broader audience within financial institutions without requiring dedicated specialized skills.

Algo Liquidity Risk helps ensure:

- Smart data management functionalities
- Simplified, quicker implementation
- Simplified daily processes
- Less need of personnel with specialized system skills
- Flexible, user-friendly reporting functionalities

Algo Liquidity Risk has extensive product coverage for both the banking and trading book. Modeling in IBM’s calculation engine enables accurate cash flows for all products. This allows the bank to estimate and report all necessary liquidity measures by legal entity, in other words, in Wholesale, Retail and Investment.

From a functional point of view, Algo Liquidity Risk has been designed to support the latest developments in best practices and help ensure compliance with incoming supervisory challenges. It helps institutions to keep under control an extensive range of issues that come under the umbrella of liquidity risk:

- *Liquid Asset Portfolio*: Sound liquidity risk management requires that institutions maintain a portfolio of unencumbered liquid assets that can be easily and quickly converted into cash in case of need. Monitoring the Liquid Asset Portfolio is ensured in Algo Liquidity Risk by catering for liquid assets classification, haircut assignment, repo monitoring, and risk indicators such as Value at Risk (VaR) that provide indications about the extent to which a drop in prices of liquid assets cause the liquidity reserve to shrink.
- *Funding Liquidity Risk (or Liquidity Mismatch Risk)*: The risk that an institution might find itself unable to fulfill its cash obligations caused by a mismatch of timing of cash inflows and outflows is the traditionally best-known facet of liquidity risk. It is addressed by means of cash flow gap reports, including discrete, cumulative and runoff reports.

- *Market Liquidity Risk:* The possibility that supposedly liquid assets in an institution's portfolio cannot be sold at their fair price because of inability by the market to absorb them results not only in a loss but, more importantly, in obtaining a smaller amount of cash than expected. This proved a crucial issue during the recent crisis because of widespread inability to fully understand and manage the connections between Market Liquidity Risk and Funding Liquidity Risk. In Algo Liquidity Risk this is addressed by means of comprehensive haircut support, including scenario-dependent haircuts.
- *Optionality Risk:* Algo Liquidity Risk caters for prepayment assumptions, which can be predetermined or dynamic dependent upon the scenario conditions. Key prepayment assumptions are draw downs, runoff of products and future assumptions for rollover of current products or issuance of new ones. Indeterminate maturity products are modeled using industry best practice methods, such as replicating portfolio procedures. Together these provide an analysis of optionality and its impact on liquidity of the balance sheet.
- *Collateral Liquidity Risk, or Margin Call Liquidity Risk:* The risk that an institution experiences unexpected calls for reimbursements or new collateral caused by the fall in value of collateral posted against cash facilities, derivatives, and so on. In Algo Liquidity Risk this is monitored by means of a number of reports catering for value and risk indicators (such as Value at Risk). It is also possible to fully integrate the results of collateral management analysis into the Liquidity Gap Report, including a scenario-based projection of margin calls.
- *Liquidity Contingency Risk:* The risk that an institution is required to provide more cash than expected as a result of future events related to engagements or third party behavior. Taken in a broad sense, this notion includes, for instance, increased draw downs on committed facilities granted to customers or increased desire of customers to retrieve their deposits. A flexible framework for behavioral models, dynamic simulations of funding and new business transactions and advanced stress test framework are provided for this task.
- *Intraday Liquidity Risk:* From a risk management perspective, the key task here is to assess the possibility that cash inflows and outflows expected on each individual day in a short-term future horizon do not offset each other caused by, for instance, different timings of inflows and outflows during the day or system disruptions that prevent access to ordinary funding sources. With Algo Liquidity Risk, the ability to assess the potential impact of intraday liquidity mismatches and the amount funding sources available to fulfill cash obligations further extends the extensive drill-down capacity of the reporting tool, so that a full set of liquidity simulation reports can be produced for each day in the selected horizon for any transaction or user-defined group of transactions, including under user-defined stress scenarios.

The major functionalities covered by the Algo Liquidity Risk solution are as follows.

Reliability of data infrastructure: Comprehensiveness, accuracy

All potential sources of liquidity risk must be taken into account. This implies among other things, gathering information about all the business of the entity: all instruments, clients, branches and more.

Smart pooling functionalities must be available in order to cope with high volume of retail transactions in a bank's balance sheet without losing risk-relevant information. Integrity of data uploaded into the system must be ensured by effective audit and correction functionalities. Accuracy of cash flow generation models must be ensured, implying comprehensive instrument modeling.

Stress testing

Stress testing is emphasized in all the supervisory documentation as the fundamental instrument for assessing liquidity risk and ensuring the ability to withstand adverse circumstances. Stress testing is also held as the fundamental reference for setting up risk tolerance policies, risk limits, liquid asset buffers and contingency plans. Institutions are increasingly required to regularly conduct and document stress tests, review inherent assumptions, deliver detailed information to senior management and report to the supervisor. Stress tests must be firm-specific and supported by the ability to configure a variety of stress assumptions, including considering the potential evolution of the balance sheet (dynamic analysis).

The example in Figure 1 illustrates the impact of the FSA idiosyncratic scenario on the cumulative cash flows of a banking institution. This is necessary because often local regulators require banks to calculate their survival horizons for various scenarios.

Integration of funding liquidity risk with market liquidity risk

Institutions must be able to analyze completely the potential impact of market risk related factors on the liquidity situation, including liquid asset prices, liquidity of individual marketable instruments and collateral obligations. Failing to understand and foresee the interactions between these phenomena has been extensively recognized as a major factor of the 2007-2009 financial crisis. This is a key element for assessing a bank's liquid asset buffer.

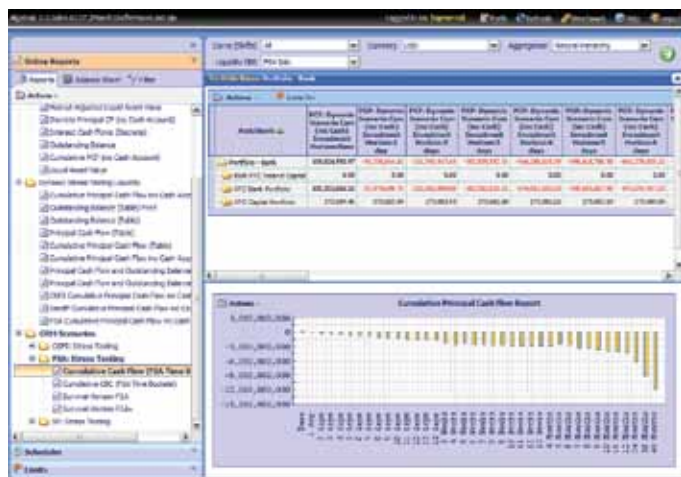


Figure 1: Cumulative Cash Flows under the FSA idiosyncratic scenario

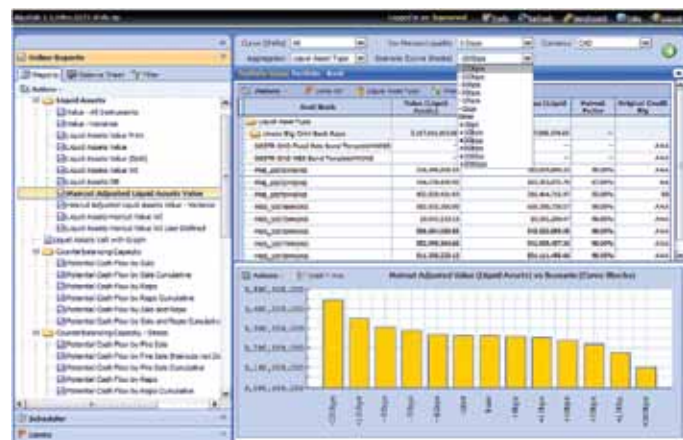


Figure 2: Haircut Adjusted Liquid Assets Value

Figure 3 shows a Cumulative Liquidity Gap report on including behaviorally modeled cash flows.

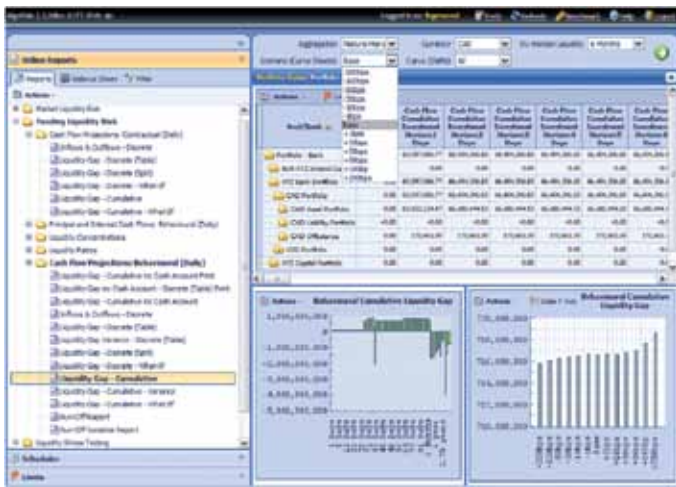


Figure 3: Cumulative cash flows under behavioral assumptions

Survival Horizons

Survival Horizon models give an indication of how long an institution will survive given its cash flow expectations and liquid asset holdings under stress assumptions of different severities. Survival Horizon is gaining space as a key synthetic indicator of risk appetite and liquidity risk exposure, and supervisory documents more or less explicitly refer to such models for assessing the soundness of the liquidity situation of an institution. The new Liquidity Coverage Ratio that banks will be asked to calculate under the new Basel Committee proposed requirements is actually based on a Survival Horizon model with defined time horizon and stress assumptions.

Proper Survival Horizon analysis implies the ability to run a wide variety of stress assumptions:

- Expected cash flows: Stress assumptions to be considered include customer deposit draw downs, rollovers of assets and liabilities, loan prepayments, draw downs on loan commitments, derivative collaterals, issuance of new assets or liabilities, inability to securitize assets and so on.
- Liquid asset buffer: Stress assumptions include interest and foreign exchange rates, issuer credit rating and market illiquidity (both in terms of higher haircuts and longer time required for liquidating assets).

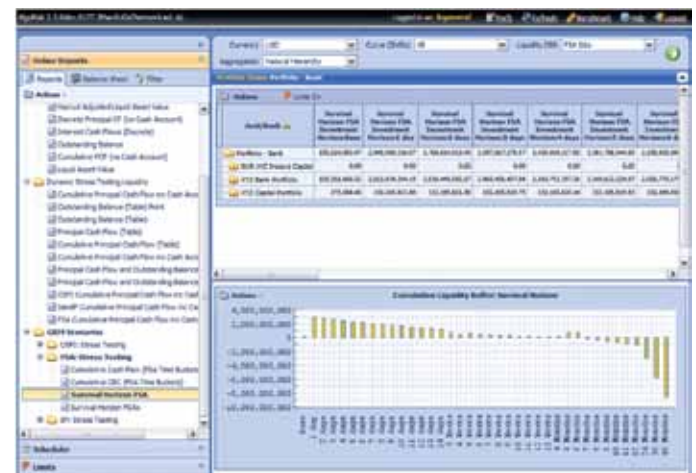


Figure 4: Survival Horizon under the FSA scenario

Figure 4 illustrates how the integration of Funding and Market Liquidity Risk comes in place within the Survival Horizon of an institution. It is constructed by considering on one hand the amount that can be raised from a fire sale of liquid assets after certain haircuts are applied and on the other hand the cash flow obligations of the institution across time.

Measuring the liquidity spread term structure

Properly pricing liquidity risk is included as a basic principle by the Basel Committee benchmark document and is being increasingly adopted by supervisors as a key means to ensure liquidity risk is assessed, remunerated and hedged within an organization. Figure 5 shows the Liquidity Premia over time coming from the swap curve and cost of funds.

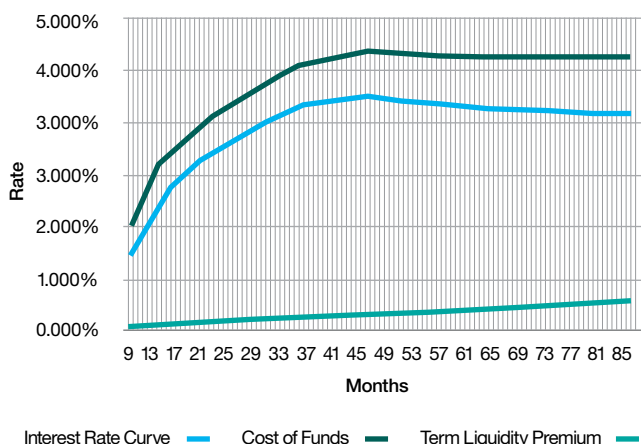


Figure 5: Liquidity Premia over time coming from the swap curve and cost of funds

Extensive dismissal of liquidity risk pricing was recognized as a factor for the crisis as it created a systemic incentive to spread excess liquidity mismatches across financial institutions. The Algo Liquidity Risk Funds Transfer Pricing functionality provides effective support to measure the liquidity risk spread term structure and charging accordingly, for both contractual and behaviorally modeled instruments.

The the report in Figure 6 enables the user to see the projection of Funds Transfer Pricing (FTP) charges over time.



Figure 6: FTP charges based on product type and across time

The report in Figure 7 enables users to analyze the FTP rates divided by Transfer Type.

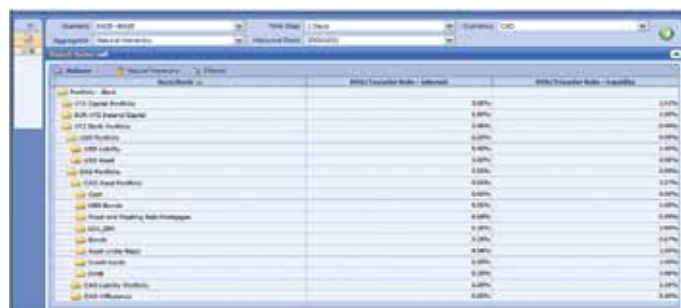


Figure 7: FTP charges divided by Transfer Types

Dynamic simulations of future business

The ability to dynamically simulate the evolution of the balance sheet is extensively outlined by regulators as key in view of understanding the potential resilience of an institution to adverse conditions. Dynamic assumptions must be considered in Survival Horizon analysis, including, for example, the ability to roll-over short-term funding transactions like deposits, CPs or repos, the potential for draw downs under loan commitments given to clients or the need to provide new business in order to maintain reputation. On a longer run, applying stress scenarios to simulated business assumptions enables a strong assessment of implications of business development on an institution’s overall equilibrium under baseline and stress circumstances. Algo patented DTS technology provides a strong coverage of these issues.

Figure 8 shows a report where a Flat Rollover scenario is supported so that new simulated mortgages are automatically issued to keep overall Outstanding Balance constant over time.

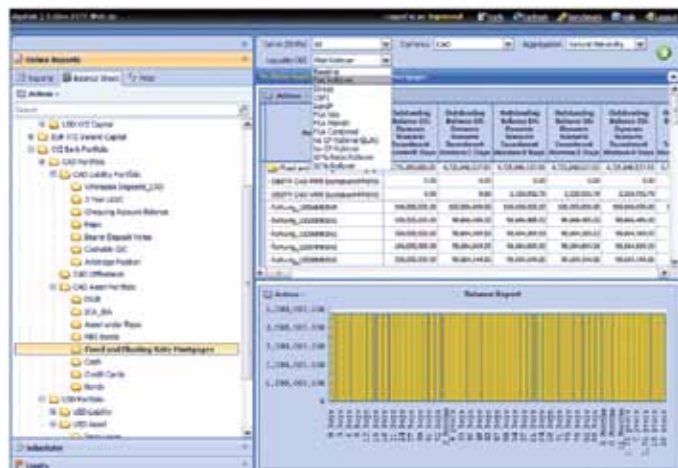


Figure 8: Dynamic Evolution of the Outstanding Balance of Mortgages

Risk policies/contingency funding plans

Financial institutions must have in place formally approved risk policies and contingency funding plans for liquidity risks. To help ensure support to this task, Algo Liquidity Risk has the ability to consistently generate all the information and indicators that the institution needs to keep under control, including extensive support of Survival Horizons (designed as required by regulators), limits, ratios (including the new Basel ones), early warnings and historical trends. Also, the system supports the production of reports as required at all the appropriate levels of the organization in order to ensure that the liquidity-related phenomena and dynamics are monitored and relevant information is disseminated throughout the institution.

Figure 9 shows an example of a report that supports a variety of stress assumptions and regulatory scenarios, the results of which can be used against an institution’s risk tolerance policy.

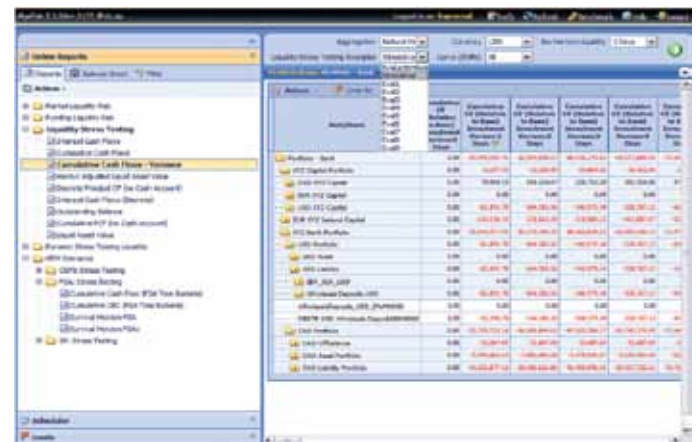


Figure 9: Cumulative cash flows for various scenarios and in comparison to the base scenario

Algo Liquidity Risk — technical overview

The crisis has brought to evidence that liquidity risk can take on many forms and come from so many sources that pure models and statistics based on probability distributions and past experience are not sufficient as a protection, and human judgment is always important. Somehow paradoxically, this leads to an even stronger emphasis on the power and quality of risk management information systems.

Liquidity risk management should be seen as a process composed of a number of subsequent steps. Quality and availability of information is a key element to sound decisions. If only a single component of the information flow is not of the required quality, the whole process is impeached as management will not have quality information available for informed decision making.

In the context of liquidity risk management, quality of information needs to be preserved in a number of respects, including:

- *Comprehensiveness*—Information from all potential risk sources in an institution
- *Integrity*—Effective audit for errors and failures
- *Consistency*—Same basic information, models and methodologies
- *Accuracy*—Extensive, state-of-the-art product coverage with accurate cash flows, pricing and optionality behavioral modeling
- *Power of analysis*—Availability of multiple risk analytics, flexibility of scenario setting for scenario analysis and stress testing, strong technical frameworks for dynamic simulations
- *Availability to relevant decision contributors*—Powerful, flexible reporting tool, with ability to analyze the risk under a number of perspectives, define new information aggregation criteria, easily set up new risk reports and indicators

In addition, the risk management framework should be organizationally effective, entailing support of limit management, dissemination of risk related information across the organization, senior management reporting and so on.

Technical architecture

The solution has been designed for speed and accuracy and addresses the complexities of simulation across scenarios and time points. The solution utilizes parallel processing, multi-threading and a fast data processing component to calculate risk analytics in a highly efficient, auditable and robust environment. End users can benefit from the interactive web-based risk reporting application to analyze risk results. The solution consists of three integrated layers that underline all functionalities covering the solution:

Data architecture layer

The solution contains the Data Services component which provides a set of standard product interfaces to input data. All Data Services products are loaded with the solution's data loader. Data files are provided in comma-separated (CSV) format from the client's source systems and data feeds. The Data Services interfaces are completely customizable. Data Services simplifies the Extraction Transfer and Load (ETL) process by requiring only essential fields. Data is verified during the data load phase and as mapped, enriched (if required) and stored in the input database. Data Services has been designed with flexible pooling and high performance in mind. Recent testing has shown that over 20 million records can be pooled in less than 10 minutes on suitable hardware. Pooling involves the aggregation of input transactions. This is all done on the input side of Data Services, resulting in high performance and manageability.

Application and analytical layer

This layer consists of the scenario generation and simulation engines, which provide an advanced and flexible framework for the modeling of portfolio risks across all different risk types.

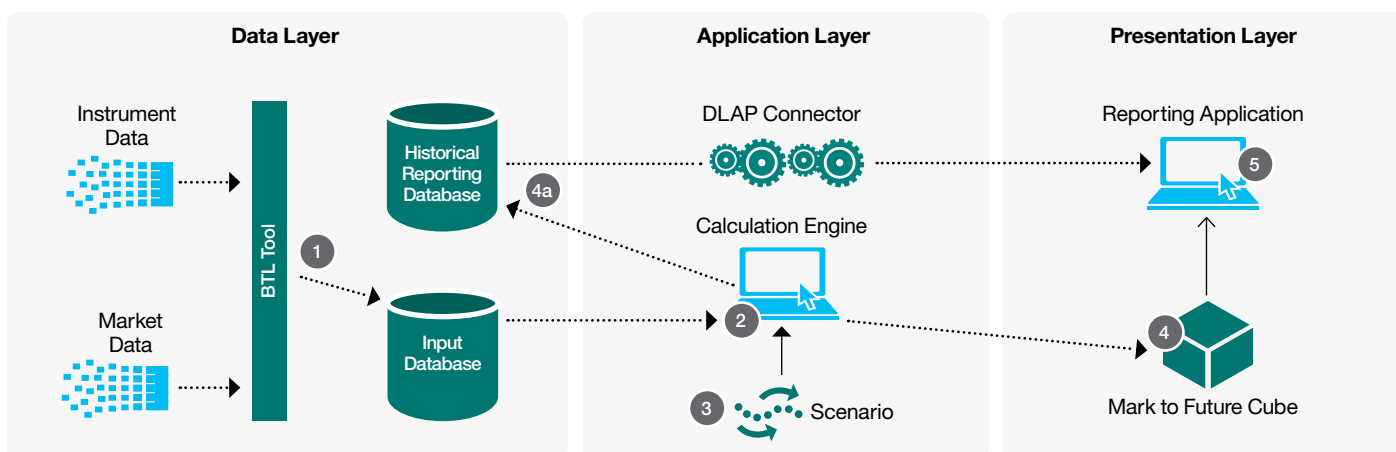


Figure 10: Algo Liquidity Risk Architecture

Aggregation and reporting layer

The aggregation engine enables the application of flexible user-defined hierarchies to simulation results on an ad hoc basis. It is designed to handle large aggregation problems that involve thousands of simulated results. The reporting application comes with a standard set of reports (templates). In addition, the user has the ability to build customized reports. Reports can be exported to a specified file directory in Excel, PDF or CSV format.

As part of the solution, a reporting application is included that stores reporting data historically. Results can be used for trend analysis and testing of assumptions. Users can specify the calculated measures and the reporting dimensions. Based on this information, the historical reporting application generates an appropriate OLAP schema, pre-aggregates data for high performance, and configures default reports within the reporting application.

The steps outlined in Figure 10 are as follows:

1. Source data is provided from source systems to ETL tool and transformed for input into the database and validated to help ensure the data correctly maps. Data is also managed into "chunks" or "federations," which allow for multiple parallel processes to decrease the time taken for simulation.
2. Relevant data is requested from the database by the calculation engine, where it can 'simulate' time and scenario. During the loading process, data is transformed and enriched.
3. Scenario data can be generated from Microsoft Excel, provided in simple CSV form or simply built within the calculation engine.
4. Stressed results are generated by the calculation engine and made available to the reporting application where risk simulation reports can be viewed and created. Business users would be given access at the reporting layer to the reporting application to view stressed results and create reports.
5. Data can de-pool back to the main system database for historical reporting.

Client source system

IBM's implementation team works with the client to generate the transaction data and market data required from source systems at the bank. Data Services plays a key role by handling much of the transformational processing required to convert bank data to formats required for processing and reporting by IBM's systems.

Data Services

Data Services has three main parts:

- Database for staging current-date input data
- Database for historical reporting data (star schema, generates OLAP cubes)
- Data management application
 - Pooling and de-pooling
 - Validation
 - Reporting support
 - Interface definition
 - Data reuse

Data interfaces cover all corporate, retail, trading and securitization exposure types the bank has. The data interfaces are customizable. Products can be constructed to fit closely to the data the bank already has in its source systems. Custom mapping, defaults and lookups help reduce the amount of ETL work required to load transactions into the system (please see the following for more details on these features).

Security

All end user and batch and automated processes are subject to authentication and authorization by IBM's security module.

Performance and scalability

Scalability processes scale in a linear fashion as hardware resources are added. Data management processes are optimized for high performance. Benchmarks are available for review. IBM provides tools that enable visualization and analysis of live batch streams for performance and troubleshooting purposes.

Batch stream control and management

IBM's batch module enables creation, customization and monitoring of the batch stream, from data loading to reporting. The batch stream analyzer is a GUI tool that provides powerful stream visualization and forensic capabilities, such as:

- Graphical execution reporting to aid in understanding what happened and why
- Detailed view of the execution so the user can navigate to low-level details when required
- Gantt chart views and graphs that enable easier identification of performance issues
- Improvements recommendations that are based on automated analysis of the execution
- Ability to invoke or start up many different IBM tools and applications

Deployment

Advanced data management functionalities

Data Services is a smart data management tool. Within Algo Liquidity Risk, it performs the following tasks.

Fast data loading

Data Services is designed to handle large volumes of data and is optimized for fast data take on. Loading speeds of over one million records a minute are expected with proper hardware configuration.

Data pooling/stratification

As the banking book usually contains a high volume of homogeneous products, such as demand deposits, grouping high volume instruments with similar characteristics into a much smaller number of pools allows for more efficient processing. Data Services pooling is done very quickly, even for very high data volumes. Data Services provides flexibility in defining pooling criteria, with a choice of pooling keys and ability to pool based on data ranges. Using Data Services, it is possible to choose almost any input dimension as a pooling key.

Optional data de-pooling

Data Services can de-pool results back down to the transaction level, using several allocation methods, while offering users the possibility to take calculated values from the calculation engine and map them back to transactional data. The advantage of de-pooling is that a user can look at specific transaction analytics and aggregate these across multiple dimensions.

Data validation/data audit

Ensuring adequate data quality is a key component of data management, especially when dealing with the high data volumes from disparate source systems typically found within the banking book. Data Services controls data quality by validating data during loading and placing a variety of audits to the loaded data to help ensure that before performing any calculation, the occurrence of errors can be minimized.

Data Services can be used to configure custom business validation rules that act over and above the normal referential integrity, domain and data type checks. Custom validation rules are invoked as part of the normal data loading process. If a custom validation rule is violated, then an audit log displays a user-configured message for the violation that is detected first.

System usability: streamlined dataflow and liquidity risk management process

Thanks to predefined GUIs, a user can use Data Services to easily configure the whole process by defining instruments, scenarios, analytics and reports. Data Services is integrated with Algo Batch to provide full end-to-end system runs. It therefore enables integrated end-to-end data processing, from data loading to reporting. Typically all data are loaded and calculations are executed in a batch process. Results include projected cash flows, scenario analysis, key ratios and the promotion of historical results for comparisons and back testing purposes. Clients can choose reporting outputs and dimensions for the automated system run.

Data dictionary

The dictionary describes all possible input fields and their required formats, and identifies how they are applied in the product. The input requirements are visible from the outset of an implementation. This facilitates improved ETL.

Predefined Streams

In addition, when choosing the Data Services extension, a user can have access to the Data Services Streams. A Stream is a preconfigured set of activities that are defined in a data mart to organize a full end-to-end process, including data upload and audit, instrument configuration, scenario setting and reporting definition. This approach effectively streamlines the dataflow and substantially enhances system usability. Different Streams have been designed for different tasks. They can entail different poolings, time buckets, scenario sets and assumptions, risk analytics and reports. Different Streams can be run in parallel during the same batch session.

Historical reporting

With the Data Services extension, calculated analytics can be stored in the database and become available for historical reporting through a direct feed to the reporting tool.

After the calculated values are reallocated and finalized, the calculation results, which have been stored in Algo Database, can be inserted, or promoted, into the historical database. The schema for the historical database is created based upon client choices during implementation.

System Features

Algo Liquidity Risk has the following system features:

What-If trade/scenario Green

Create new scenarios and trades intraday to supplement those run as an overnight batch process and by intraday amendment streams. With a fully-integrated GUI, users can create a new scenario on the fly that is related to market risk factors, behavioral risk factors or ongoing business assumptions. Users can also create new hypothetical or actual trades intraday that have not been previously conceived and see the impact of these on the balance sheet. For example, a user can simulate the potential impact on liquidity gap of the new trade. This functionality is especially useful for constructing hypothetical balance sheet hedges.

On-demand de-pooling

On-demand de-pooling enables users to see all instruments within a pool. At reporting time, a user can select one or more pools to de-pool, either explicitly or based on general characteristics, and therefore be able to view all underlying transactions within the pool. The primary business benefits offered by an on-demand de-pooling feature is faster end-to-end processing time, without any functional sacrifice on the reporting side.

Drill-down

Drill-down functionality is similar to the on-demand de-pooling but with one major difference. The drill-down functionality re-computes the results of the underlying exposures without pooling. Thus, the individual results may be analyzed for outliers, the terms and conditions on the underlying accounts can be checked and “true” aggregate account risk numbers can be compared to the pool risk numbers. This functionality can ease the process of inspecting individual accounts for errors and other discrepancies and also to account level for corporate and contractual accounts only for concentration risk analysis to assess single client exposures.

Drill-through

With the drill-through function, users can view all terms and conditions of a transaction and further details of associated data, such as yield curves and scenarios. Drill-through can aid the user in understanding the different results and the assumptions behind the analytics.

Amendments

Amendment stream enables the client to make intra day changes to data and run them through from end-to-end to reporting. This provides the capability to correct data errors and add additional trades that have occurred during the day.

Algo Liquidity Risk functionalities

The set of core functionalities of Algo Liquidity Risk is extensive and caters to the main best practice requirements for effective liquidity risk management, including:

- Integration of different types of liquidity risk (such as, market and funding liquidity risk)
- Comprehensive analysis of the liquid asset buffer
- Twin view of contractual and behaviorally modeled cash flows
- Stress testing ability
- Calculation of survival horizon
- Full functionality of the reporting tool, including tens of predefined reports, ratios, early warnings and limit support

Liquidity Buffer and Survival Horizon

This extension further extends on the already extensive set of core functionalities available and adds an advanced layer of analysis. In addition to assessing the value and haircuts applicable to its liquid assets, with the Liquidity Buffer and Survival Horizon extension, users can consider the time lag potentially required to liquidate the assets in the portfolio under base and stress conditions. This additional layer of analysis is factored in the Survival Horizon report.

Basel Liquidity Ratio Reports

This extension supports the calculation of the Liquidity Coverage Ratio and the Net Stable Funding Ratio as defined in the BCBS published in December 2010 and the reporting of the five monitoring tools included in the same document.

Fed 4G Liquidity Reporting

This extension supports the 4G enhanced liquidity reporting for large financial institutions. Detailed contractual cash flow reporting with entity level requirements is produced. Algo Liquidity risk follows the evolving US regulatory expectations for liquidity.

A number of specialized extensions can be added to the core functionalities for more advanced support of the liquidity risk management process that fully exploits the potential of the solution.

Optional Extensions

The optional extensions of Algo Liquidity Risk are as follows:

Dynamic Balance Sheet Strategy

This extension builds on the IBM's patented technology, DBS. Further to a set of pre-configured re-investment and re-funding strategies, users can build dynamic simulations of the balance sheet using a sophisticated macro language Risk++, including conditional assumptions such as limits on future cashflow gaps to drive new business, rollovers, new funding and so on. Stressing the future dynamic assumptions is supported.

Funds transfer pricing

This extension allows for calculation of liquidity risk charges to cater for pricing of liquidity risk as required by regulators. A number of methodologies are supported for determining the appropriate liquidity spread to be attached to each transaction.

FSA liquidity regulatory reports

This extension supports the production of liquidity risk reports as required under the new regulation from the U.K. Financial Services Authority (PS 9/16). With this extension, the client can prepare FSA047 — FSA054 liquidity reports and in addition, FSA047/FSA048 can be produced for submission in Gabriel format.

OSFI liquidity reporting

This extension supports OSFI's (the Canadian regulator) enhanced liquidity reporting for large financial institutions. The specific categorization of both banking and trading book products is implemented in the system, which enables contractual cash flow reporting at granular level as required.

Key benefits

The Algo Liquidity Risk offers an integrated, comprehensive, scenario-based platform to address these challenges. With the flexibility to support information gathering from all potential risk sources in an institution, Algo Liquidity Risk offers complete product coverage, an advanced framework for a variety of behavioral models and multiple liquidity risk analytics and stochastic stress test scenario-based simulation of future business.

IBM's Liquidity Risk solution offers a range of benefits to its clients, all necessary for a proper liquidity risk management, while helping them adopt best practices and address the demands of regulators.

Helps to monitor and manage risk in accordance with risk tolerance and internal objectives

A rich and flexible reporting platform provides a user-friendly, comprehensive, user-modifiable set of timely and forward-looking information that is a powerful tool for improving risk awareness, monitoring risk from different departments and products and addressing compliance with internal and external constraints. Risks can be monitored at any level of the flexible reporting and portfolio hierarchies, with limits attachable at virtually at any level of portfolio aggregation—from granular to legal entity and enterprise in the reporting GUI, including under scenarios. New reports can be built up by the user with the straightforward Report Builder GUI. Multiple views of the risk by means of diverse risk indicators, stress testing and what-if analysis can be obtained in real time and modified on the fly with no need to process a lengthy recalculation.

Helps institutions perform a variety of liquidity stress tests

Institutions are required by regulations to run regular stress test analysis for liquidity risk. They are also required to define a liquidity risk tolerance to be defined in consideration of stress scenarios, aimed at ensuring resilience against “... a prolonged period of stress.” (Basel Committee, 2008) Algo Liquidity Risk provides an advanced framework for comprehensive scenario and stress test analysis. It includes a wide number of stress scenario based indicators—including stochastic, deterministic and historical scenarios. Additional scenarios can be designed by the user. With Algo Liquidity Risk's dynamic analysis capability, stress analysis can be applied to future funding and business transactions for a powerful assessment of funding needs and potential risk.

Helps disseminate risk information throughout the organization

The Algo Liquidity Risk reporting tool is web-based for easier distribution of information to all levels of the organization. Information can be aggregated at different levels of the portfolio hierarchy to achieve the detail suitable to each level of the organization. Differentiated access by multiple users can be managed as desired by means of passwords and authorizations.

Provides accurate cash flow projections for a large set of instruments

Thanks to integration of the calculation engine with IBM Algo Market® Risk and Algo Asset Liability Management, Algo Liquidity Risk benefits from advanced product modeling and cash flow projections. Accurate cash flow projections are then provided for assets, liabilities and off-balance sheet instruments. Cash flow projections are scenario-dependent and can therefore be made subject to scenario analysis and stress testing directly in the reporting GUI. Time horizons are designed as appropriate for sound management of liquidity risk.

Provides a wide variety of customized risk measurement tools and metrics

Because there is no single metric that can exhaustively describe liquidity risk, a variety of risk measurement tools and indicators is mentioned in best practice literature as key to ensure resilience against unexpected market strains. In Algo Liquidity Risk, a wide range of such indicators is supplied. Liquidity mismatch reports are available under the discrete, cumulative and runoff views. A variety of risk measures is provided, including static (gaps, values, ratios), historical scenario-based and stochastic. A range of predefined ratios is presented, selected among those most referenced in literature. In addition, the possibility of conducting genuine, risk-based simulations of future business with the dynamic analysis capability provides an additional, powerful tool for assessment of risks inherent in future business development and financial sustainability under scenarios.

Helps manage the Liquidity “Buffer”

The need to monitor the holdings of liquid assets that can work as a cushion against liquidity strains is addressed with a set of dedicated reports. Categorization of assets by degree of liquidity is allowed as well as definition of prudential haircuts. A variety of risk indicators is provided—both for unencumbered liquid assets and for assets that are already used as collateral that are not available for new cash raising until maturity of the outstanding transactions. Haircut scenarios can be designed. With the Liquidity Buffer and Survival Horizon extension, it is possible to set limits to the amount of each instrument in the liquid assets portfolio that the user deems possible to dispose of or pledge in one single day for a more accurate estimate of the time needed to actually transform liquid assets into cash.

Integrates different types of liquidity risk, including funding and market liquidity risk

Widespread shortcomings in understanding the links between different types of liquidity risk, including market and funding liquidity risks, were a major reason for failures during the 2007 crisis. Algo Liquidity Risk fully integrates funding, or mismatch, liquidity risk with market liquidity risk (the risk that assets considered liquid cannot be actually sold or repossessed, if at all, without a strong discount). Algo Liquidity Risk also addresses additional types of risk that may arise from fluctuation of market parameters (such as, decrease in value of liquid assets or new calls on collateralized instruments) or from unexpected events (such as, change in customer behavior for demand deposits or withdrawal of committed lines). Concentration risk is also specifically addressed with dedicated reports.

Supports behavioral models for non-maturity instruments

In Algo Liquidity Risk, twin views are provided as standard for future cash flows that relate to instruments that can affect the liquidity position as a result of third party behavior: demand deposits, revolving facilities and pre-payable mortgages. A set of gap reports and related risk measures is presented both under a contractual view (in other words, modeling cash flows as resulting from contractual clauses) and under a behaviorally modeled view.

Supports limits management

In Liquidity Risk, limits can be attached to virtually any figure available in the reporting tool, at all levels of the portfolio hierarchy. Limits can even be attached to scenario-based figures. Limits setup is extremely straightforward, and limit monitoring is facilitated by synthetic reports equipped with stoplight-like outlines.

Supports risk-based dynamic simulations of future funding/business transactions

With dynamic analysis, users have the capacity to perform a genuine risk-based, dynamic simulation of future business. Dynamic simulations are of special importance for liquidity risk management. With dynamic analysis, users can simulate rollover of short-term instrument and new business developments, assess inherent risks and perform dedicated scenario and stress test analysis on a time horizon they can define. Behavioral assumptions on non-maturity instruments and stress testing thereof can be incorporated in scenario analysis for a more powerful assessment of risk exposure and overall financial stability.

Additional resources

For further information and details, please refer to the following documents issued by IBM:

Response to the Basel Committee's request for comments on the consultative document, Oct 2012 available at ibm.com/common/ssi/cgi-bin/ssialias?subtype=WH&infotype=SA&appname=SWGE_YT_YT_USEN&htmlfid=YTW03249USEN&attachment=YTW03249USEN.PDF.

Basel III: What is new? Business and technological challenges, Oct 2012, available at ibm.com/common/ssi/cgi-bin/ssialias?subtype=WH&infotype=SA&appname=SWGE_YT_YT_USEN&htmlfid=YTW03289USEN&attachment=YTW03289USEN.PDF.

Dodd-Frank Wall Street Reform and Consumer Act: Business model implications, Oct 2012, available at ibm.com/common/ssi/cgi-bin/ssialias?subtype=WH&infotype=SA&appname=SWGE_YT_YT_USEN&htmlfid=YTW03222USEN&attachment=YTW03222USEN.PDF://www.algorithmics.com/EN/publications/whitepapers/.

Liquidity risk management: Assessing and planning for adverse events, Oct 2012, available at ibm.com/common/ssi/cgi-bin/ssialias?subtype=WH&infotype=SA&appname=SWGE_YT_YT_USEN&htmlfid=YTW03261USEN&attachment=YTW03261USEN.PDF.

About Business Analytics

IBM Business Analytics software delivers data-driven insights that help organizations work smarter and outperform their peers. This comprehensive portfolio includes solutions for business intelligence, predictive analytics and decision management, performance management, and risk management.

Business Analytics solutions enable companies to identify and visualize trends and patterns in areas, such as customer analytics, that can have a profound effect on business performance. They can compare scenarios, anticipate potential threats and opportunities, better plan, budget and forecast resources, balance risks against expected returns and work to meet regulatory requirements. By making analytics widely available, organizations can align tactical and strategic decision-making to achieve business goals. For further information please visit ibm.com/business-analytics.



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