ORACLE

Cash Flow Engine as a Central Component of Modern Risk and Finance

Turbocharge your modernisation journey with a focus on cash flows

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PURPOSE STATEMENT

This document provides an overview of various business use cases that need cash flow estimates, their unique expectations and details key aspects to be considered for the successful implementation of a cash flow engine.

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BACKGROUND

Cash flow estimates have been an integral part of Asset Liability Management (ALM) function in banks and financial institutions. Traditionally, ALM applications have been using some form of cash flow forecasting based on contract level attributes and bucketing assumptions.

In recent years, usage of cash flow projections has expanded to other areas of risk management and balance sheet management—a trend largely attributed to evolving regulations and increased interaction among various risk and finance functions. The triggers include requirements coming from accounting, regulatory reporting and statutory reporting as well as internal performance management and balance sheet management functions. While conventional ALM analysis would be focused on aggregate level bucketed cash flows, the newer requirements mandate availability of cash flow projections at more granular customer account level.

A common Cash Flow Engine (CFE) catering to enterprise-wide requirements provides the foundation on which multiple risk and finance processes can be built. It helps break the functional silos by creating a unified repository of data, configurations, models and assumptions—ensuring consistency in internal and external reporting.

This paper explores business use cases that need cash flow estimates and their unique expectations. It discusses the key questions and decision points that banks need to consider and provides recommendations based on our learnings from processes followed by banks globally.

CASH FLOW ENGINE: USE CASES

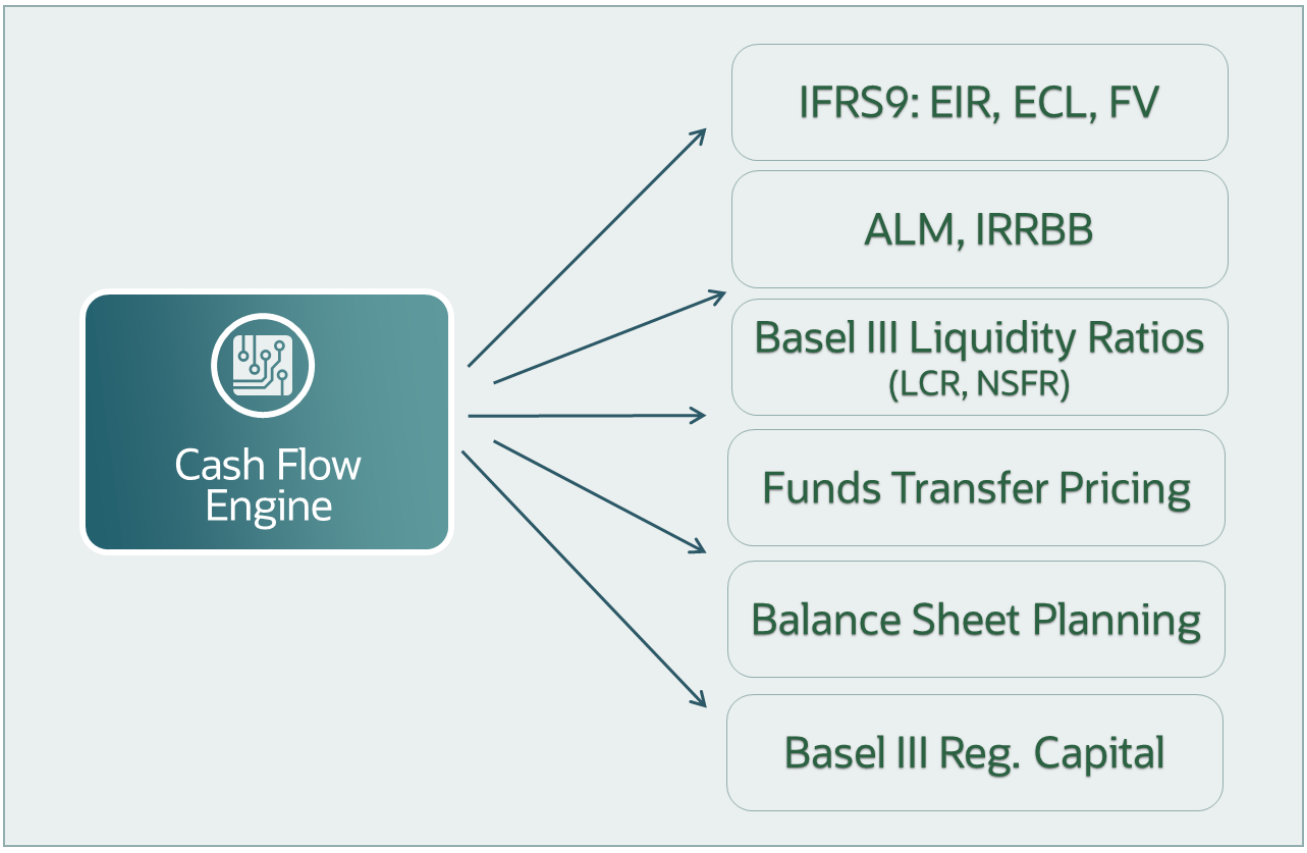

Image 1. Centralised cash flow engine feeding into various functional processes

Besides ALM requirements around liquidity and interest rate risk, there are a number of use cases that require cash flow estimation. These span across diverse areas within risk and finance space, such as IFRS9, Basel III liquidity ratios, Basel III regulatory capital, funds transfer pricing and balance sheet planning. Each of these has its own unique requirements around estimation and application of cash flows. While the following sections focus on cash flows, it must be noted that the downstream calculations and metrics described here as part of the use cases will require specific applications or engines.

Here is a brief description of nuances of cash flow estimation and usage across different use cases:

IFRS9: Financial Instruments

IFRS9 deals with how financial instruments are classified, measured and accounted for. There are four specific use cases under IFRS9 that require estimates of contract level cash flows:

- Effective Interest Rate (EIR)
- Expected Credit Loss (ECL)
- Modification gain or loss
- Fair Valuation

The standards mandate that cash flow estimates must consider all contractual terms including prepayment, extension, call options, etc. through the expected life of the instrument. Further, calculation of EIR requires origination date cash flows in addition to current date cash flows.

Basel III Liquidity Ratios and Stress Testing

Regulatory changes in the aftermath of the global financial crisis included new requirements around liquidity—Liquidity Coverage Ratio (LCR), Net Stable Funding Ratio (NSFR) and accompanying stress testing requirements based on a combination of idiosyncratic and market-wide shocks. LCR seeks to promote short-term resilience of a bank's liquidity risk profile. NSFR, on the other hand, aims to ensure maintenance of a stable funding profile in relation to a bank's asset composition and off-balance sheet activities.

These requirements involve looking at the contractual cash flows and then applying a set of behavioural assumptions and weights. LCR covers a 30-day horizon and NSFR is based on a 1-year period. In addition to calculating the prescribed metrics of LCR and NSFR, the analysis is extended to look at the liquidity gaps across time buckets and under different stress scenarios.

Funds Transfer Pricing (FTP)

FTP has been at the heart of a bank's performance management framework and the methodologies have evolved over the past couple of decades. The concept of matched maturity transfer pricing has come to the fore as the industry standard—where FTP rates are calculated by matching an instrument's maturity and repricing characteristics with market based cost of funds curves. These methodologies increasingly rely on granular projections of cash flows to derive measures like duration, weighted term, average life, etc. The cash flows need to consider prepayments, early redemptions and other applicable behaviour profiles. Various FTP methodologies in practice demand flexibility in terms of the cash flow projection horizon—for example, we may want to consider cash flow only up to the next repricing date in case of floating rate loans and cash flows from origination till maturity date for fixed rate loans. Usage of cash flows is further dependent on the FTP methodologies selected for different portfolios, as not all products and methodologies will require cash flows.

Balance Sheet Planning

As the focus of balance sheet planning becomes granular, banks are increasingly using detailed cash flows for generating forecast of new business volumes and Net Interest Margins (NIM). The process would typically work in tandem with the enterprise planning tools and the cash flow output for current business need to be available separately for current book and future new business projections. This gives the financial planning teams a better insight into the NIM and profitability of each business line or segment and facilitates informed business decisions.

Basel III Regulatory Capital

Effective maturity is required as a risk parameter for banks following Advanced Internal Ratings Based approach (AIRB) for capital calculations. This is applicable for the wholesale portfolio (asset classes: Corporate, Sovereign and Bank) and needs to be estimated for each exposure based on timing of the contractual cash flows. Cash flows for this purpose will need to be generated only for wholesale portfolios and for instruments subject to a determined cash flow schedule.

CASH FLOW ESTIMATION: EXPECTATIONS

Given the diverse nature of their application across different use cases, there are certain expectations that the cash flow estimates must meet. These expectations have evolved as the usage of cash flows has expanded beyond conventional ALM functions. Many of these have in particular emanated from the need to have auditability, transparency and consistency in assumptions, besides a reasonable level of accuracy. Here are some of the key expectations which would drive how we define processes for cash flow estimation:

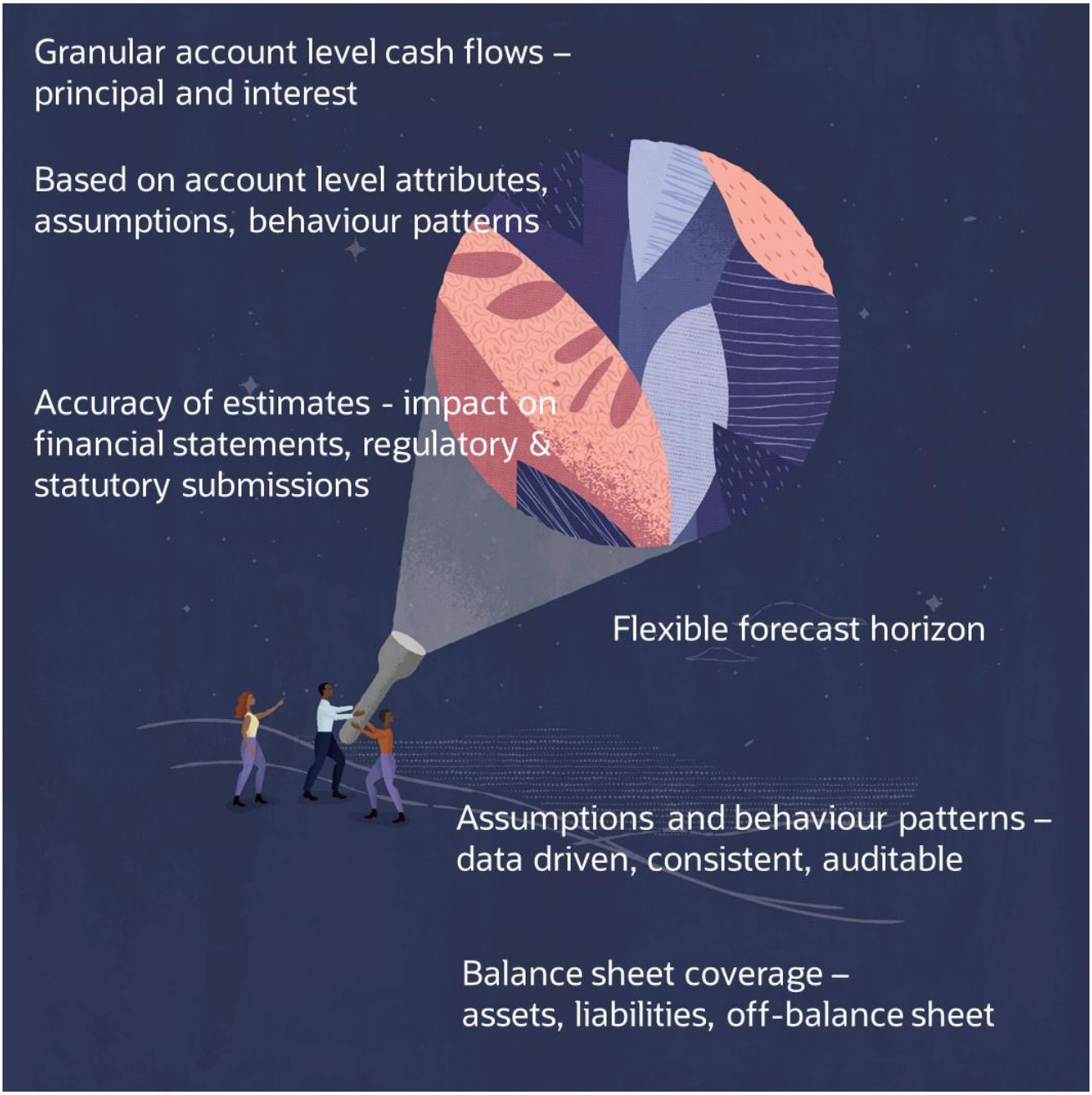

Image 2. Cash flow estimates—expectations driven by end-use

- Various use cases discussed above require granular cash flow estimates to be available at customer account level. These should be based on account level attributes—attributes related with balances, maturity, payment, interest rate and re-pricing. Assumptions and behaviour patterns should be considered where applicable.
- Assumptions should be based on modeling on historical data and should be transparent and auditable.

- In view of the fact that use cases like EIR and ECL form part of financial statements and have direct bearing on the bank's bottom-line, there is an increased scrutiny of how cash flows are estimated, including accuracy of the estimates and reasonableness of the assumptions.
- Interest and principal cash flows need to be estimated separately. The estimates should consider different dates and frequencies for interest and principal payments if applicable.
- Different use cases require different time horizons for cash flow estimation. Flexibility is required to have cash flows available as per required horizon—from origination date or current date up to contractual maturity, expected maturity, or for specific period (next 30 days, next 1 year, etc.).
- Cash flow estimates need to be available for all instruments—assets, liabilities, derivatives and other off-balance sheet instruments.
- Ability to accurately model cash flows for structured and non-conventional payment and re-pricing patterns, including instruments with special features like teaser rates, inflation-indexed, tiered-rates and offset accounts.
- The process for cash flow estimation should be completed within a reasonable time-frame given that some of the use cases need cash flows on daily basis. It's critical that the engine has the ability to efficiently process large data volumes in a short time window.

KEY CONSIDERATIONS

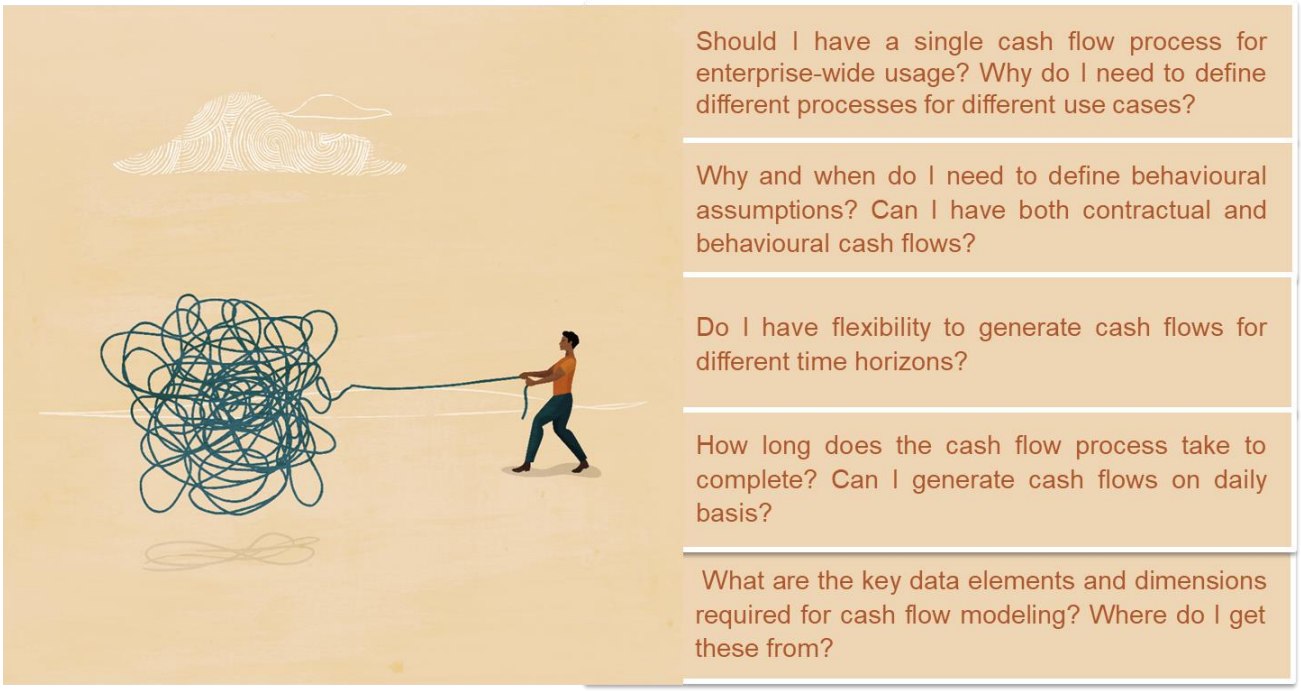

Image 3. Untangling the implementation questions

Contractual versus Behavioural

As mentioned earlier, some of the use cases like LCR/NSFR would require contractual cash flows, whereas others like IFRS9 must use behavioural cash flows based on expected life rather than contractual maturity. This means we need to define cash flow processes with or without assumptions depending on what the target use case is.

Prepayment behaviour needs to be modeled for products like mortgage loans, where typically long-term loans (say, having contractual maturity of 30 years) are repaid in a shorter timeframe (say, behavioural maturity turns out to be 12 years) or term deposits where customers might redeem the deposits earlier than the agreed maturity date. A particular product's or portfolio's behaviour for prepayment or early redemption can be modeled using historical data and relevant variables related with aging, maturity and rates. In addition, we will need variables for segmenting the portfolios in a meaningful way. In terms of implementation, these models can be part of the same platform (thus ensuring a seamless flow into cash flow processes) or they can reside in an external modeling environment (in which case the output of the models will need to be integrated as configuration parameters). In practice, prepayment models generate output in terms

of a prepayment rate or expected life by portfolio which would need to be considered in cash flow estimation process. The engine needs to have flexibility to accept configuration parameters either as prepayment rates or as expected life.

Besides prepayment behaviour, there are other behaviour patterns that need to be factored in such as non-maturity behaviour patterns in case of current or demand deposits (core-volatile) and payment of credit card dues.

Projection Horizon

Different use cases have different expectations regarding the time horizon over which cash flows should be projected. While some use cases would require projections over the full life of an instrument, others would need cash flows only upto a certain period. For example, LCR needs projections upto 30 days, FTP in case of floating rate instruments might want to look at cash flows only till next reprice date. ALM and IFRS9 would typically require cash flows over the full life or expected life of the instrument. Further, EIR needs origination date cash flows. Considering the required time horizon will make the cash flow processes more efficient and relevant for the target application. The CFE would typically provide configurable options for projection till maturity (from origination date or current date), till next reprice date (from last re-price date or current date) or till specific period (e.g. 30 days, 1 year, etc.).

Processing Frequency and Process Optimisation

We need to consider the processing frequency required for different processes—whether cash flow needs to be generated daily, weekly, monthly, etc. Cash flow modeling is a complex and data-intensive process, as we are trying to project cash flows at customer account level for millions of accounts. When this process needs to be run on daily basis and there are deadlines for regulatory submissions (such as LCR reporting on T+1 basis), it becomes critical to have a lean process tailored to the specific application requirements that can quickly generate the cash flows and pass them on to the downstream computation processes. Specifically for LCR, it would be advisable to restrict the process to the specific time horizon (30 days) instead of projecting cash flows till maturity.

Another way of optimizing the process would be to assess if some of the accounts (such as current/savings accounts) can be pooled or aggregated, as the bucketing assumptions for such accounts may be common across portfolios. This may work for applications like LCR but not necessarily for all other use cases. Hence a decision can be taken considering the end use. Further, we need to consider the instrument coverage required for the specific application. For example, liquidity related applications would require cash flow projection for the full balance sheet, whereas EIR/ECL might need cash flows only for specific asset products. Building such filters in the process definition would ensure that only the required set of data is processed, thus minimizing the run time. There are additional configuration options available with the engine to ensure faster execution through multi-processing.

Data Sourcing

Cash flow estimation is a data-intensive process. Hence, data sourcing strategy becomes critical for a successful implementation. Data is required at customer account level and the attributes include-

- Static attributes: payment frequency, reprice frequency, amortization type, day count convention, product, currency, etc.
- Dynamic attributes: balances, rates, etc.
- Triggers: next payment date, next re-price date, etc.

Besides, we will have several dimensions and other attributes to be used for building assumptions and analyses. Strategy for data sourcing should be formulated keeping all current and future applications in mind rather than standalone cash flow processes, so as to avoid duplication of efforts. A data foundation layer with common staging area and pre-defined data structures at required granularity helps in this regard.

The data would typically be sourced from core banking or different product systems such as loans/deposits/treasury systems. An assessment of data availability and gaps needs to be done as part of the implementation. For any gaps that are identified, we can decide on assigning default values or potential derivation from other available data elements. Quite often, we come across cases of non-standard payments where conventional amortization types would not work. In such situations, we would explore using user defined patterns or other workarounds; alternately we can get the payment schedule from the product systems if available. At times, certain regulatory changes would bring in additional complexities. For example, moratorium related guidelines issued in view of the pandemic or benchmark (IBOR) related changes. Such situations would call for changes to existing configurations or plugging in additional piece of code to handle the complexities.

A process for reconciliation and data quality checks is important to ensure that data being used for is of acceptable quality. Reconciliation of general ledger balances with the instrument level balances coming in from product systems is done to ensure integrity of the reporting. In addition, various data quality checks such as referential integrity check, null value check, range check and business checks are performed before the data is pushed to the cash flow engine and other processing engines. In this context, efforts should be made to leverage the standard pre-built validation checks which could be supplemented with additional validations that might be required. The validation checks are usually split between those specific to cash flow process and those applicable for other downstream processes.

Product Dimension for Cash Flow Modeling

Another key consideration related with data is around modeling product dimension, i.e. the dimension used to define the assumptions, patterns and processes. In many cases, product dimension (from source systems) may be sufficient to model the cash flows. However, for applications like ALM and FTP where additional attributes might be required, it's a common practice to create a synthetic product dimension in order to support the modeling and processing requirements. Such synthetic dimensions are known as modeling product dimension or chart of accounts. A modeling product dimension would typically be a combination of source product dimension and additional dimensions and attributes such as customer type, credit rating, interest rate type, inter-company indicator, legal entity, country, etc. Modeling product dimension needs to be designed correctly considering overall requirements while avoiding unnecessary complexities that would hamper process efficiencies.

Single Unified Cash Flow Process or Multiple Processes?

There is a temptation to go with a single unified cash flow process to generate one common set of cash flows that can be consumed by different business processes across the enterprise. This may not always work. What are the factors that will drive the decision on whether a single unified process will work best or multiple processes specific to target use cases would be needed? The answer will depend on requirements of the target applications. In particular, we need to consider the following aspects for each application:

- Is the cash flow based on contractual maturity?
- Are behavioural assumptions needed?
- At what frequency does the process need to be executed?
- What instruments or products are covered?
- What is the horizon for cash flow projection?

Answers to the above questions will drive whether we need to have specific processes for each use case. In most of the cases, one-size-fits-all cash flow modeling will not work and it makes more sense to have separate process definitions as per needs of each use case. While we define multiple processes to support the diversity of requirements, the underlying data, assumptions and models need not be duplicated; these will be defined once and can be included or excluded in a process as needed.

Following table gives an example of different processes based on diverse requirements:

PROCESS	FREQUENCY	INSTRUMENT COVERAGE	CONTRACTUAL/ BEHAVIOURAL	HORIZON
Cash flow for LCR	Daily	All	Contractual	30 days
Cash flow for NSFR	Monthly	All	Contractual	1 year
Cash flows for liquidity stress test	Daily/Ad hoc	All	Behavioural	1–3 years
Cash flow for IFRS9	Monthly	Assets	Behavioural	Expected Life
Origination cash flow for IFRS9 (EIR)	Monthly	Assets	Behavioural	Expected Life (from origination date)
ALM liquidity gap	Daily	All	Behavioural	Expected Life
ALM re-pricing gap	Monthly	All	Behavioural	Expected Life

Net Interest Income	Monthly	All	Behavioural	Expected Life
Economic Value of Equity	Monthly	All	Behavioural	Expected Life
Funds Transfer Pricing	Monthly	All*	Behavioural	Expected Life
Cash flow for Basel IRB	Monthly	Assets—Wholesale	Contractual	Contractual Life

*depending on FTP methodologies selected for different products

Table 1. Multiple cash flow processes catering to diverse requirements

BENEFITS OF A CENTRALISED CASH FLOW ENGINE

Having the ability to forecast cash flows at granular level with reasonable accuracy is fundamental to banks' day-to-day operations as well as their survival in a crisis situation. The cash flow projections enable deeper analysis and provide valuable insights into the institution's liquidity situation and how things could unfold under stress scenarios. This helps formulate a proactive balance sheet management strategy and timely response when things turn bad. Besides traditional ALM, liquidity and balance sheet management functions, several use cases have emerged across regulatory and financial reporting that require detailed account level cash flows.

In this backdrop, a centralised cash flow engine can provide a foundation for modernisation efforts across risk and finance functions. Here are the top three benefits that a common cash flow engine catering to enterprise-wide requirements brings in:

1. Consistency in internal and external reporting—more time available for analysis and decision making rather than spending time in reconciliation across engines and platforms
2. Unified data layer comprising reconciled account level data, with relevant dimensions and reference data that can be leveraged for downstream risk and finance use cases.
3. Common repository of models, assumptions and business configurations that is auditable and available for flexible usage across different use cases.

Image4: Key benefits of a centralised cash flow engine

CONCLUSION

As usage of cash flow expands to different risk and finance applications spanning across accounting, regulatory reporting, statutory reporting, MIS and analytics, banks and financial institutions are looking at cash flow engine as a central component that can cater to diverse requirements such as IFRS9, liquidity risk, stress testing, performance management and balance sheet planning. Each of these use cases have their own unique expectations around granularity and accuracy of cash flows, behavioural assumptions, forecast horizon and processing frequency. This means a single one-size-fits-all cash flow process will not work and we need to define multiple processes that could be based on a common repository of data, models and assumptions.

In view of the diverse nature of various use cases and how the downstream processes consume cash flows, we conclude with the following recommendations:

- Definition of cash flow processes should be driven by the unique requirements of specific use cases.
- All cash flow processes should be based on a common reconciled data layer.
- A common framework for managing models and assumptions should be defined to support different business functions.

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