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RMB FTP FUNDING – Conceptual Design

Project nXt

August 2019



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DOCUMENT CONTROL

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1.1 Document History

Version	Revision Date	Amended By	Comments
v0.7	01/06/2019	Martin Malec	Initial version sent for comments to GTSY & Nxt Fin team
V0.8		Martin Malec	GTSY comments incorporated & added section 7.1 – ‘GTSY funding set-up requirements’
V0.9		Martin Malec	nXt Finance team and Jateen Chagan’s comments incorporated, chapter 8 – IBD specific funding set-up requirements added.
V0.91		Martin Malec	IBD comments incorporated
V0.92		Martin Malec	Updated organizational scope based on latest closing entities list from Jateen
V0.93		Martin Malec	Updated organizational scope, added description of different FR entities
V0.96		Martin Malec	Updates chapter 8 – IBD specific funding set-up requirements

1.2 Reference Documents

Name	Comments
Elixir principles document???	



2. INTRODUCTION

Project nXt aims to consolidate majority of the fixed income, currency, commodities, equity, credit and structuring products onto new Murex platform and to decommission current dispersed GM application architecture, including current RMB funding platform Chameleon. Hence nXt implementation necessitates to move from the current funding solution in Chameleon onto a new solution in Murex.

This document proposes a conceptual design for a new RMB funding solution based on the Murex platform and its set of capabilities.



3. BUSINESS CONTEXT

This chapter provides business context for the solution outlined in this document.

Business objectives driving implementation of the new RMB funding solution on Murex are to:

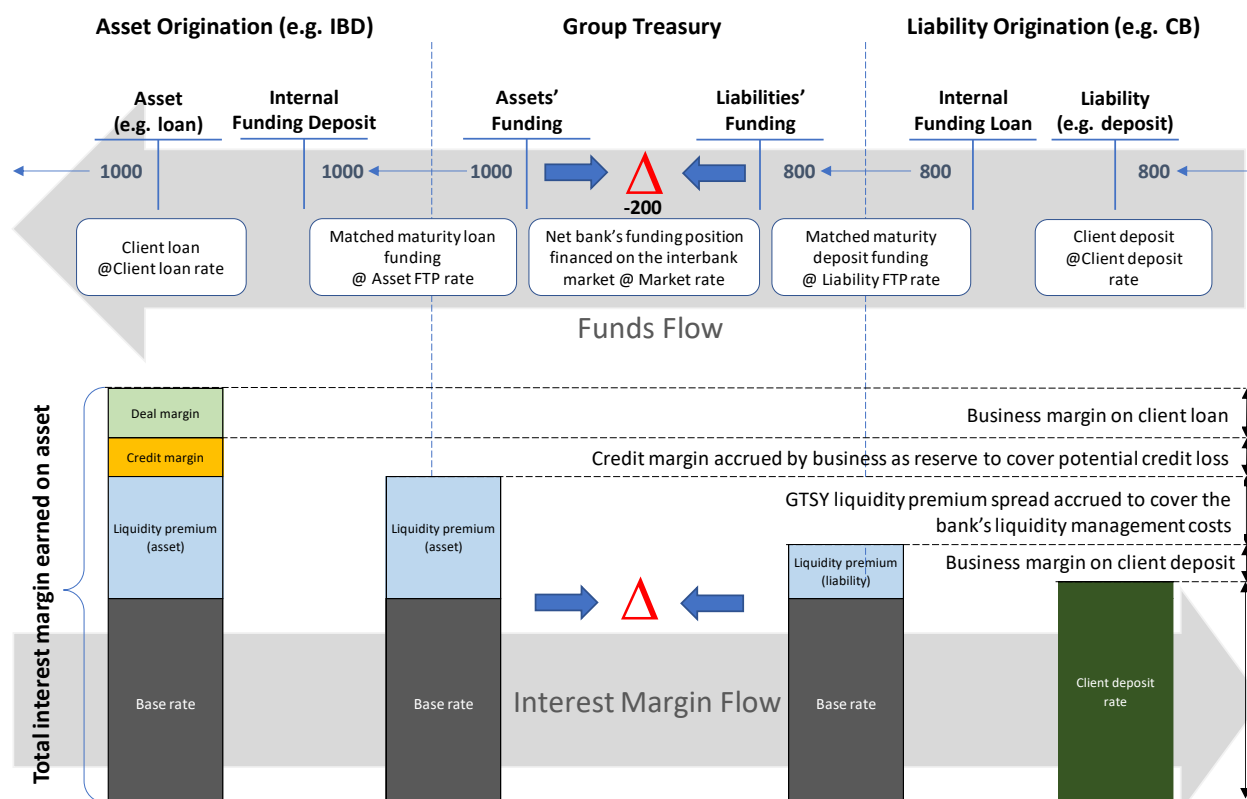
- Move from the current 'cash-based' funding approach when liquidity premium reflecting underlying product tenure is calculated and charged out by GTSY monthly to a real time automated FTP process resulting in improved internal funding pricing transparency and detail, as well as improved efficiency of the bank's liquidity risk management.
- Enable decommissioning of Chameleon application that currently also performs RMB funding function.

3.1 Funds transfer pricing (FTP) mechanism

Funds transfer pricing (FTP) is a process that:

- Consolidates bank's funding requirements resulting from provision of bank's products in central Treasury book. This enables Treasury to efficiently control and manage the bank's funding and maturity mismatch.
- Prices funding costs/benefits of bank's products/business lines to establish true profitability of these products/business lines.

The following diagram illustrates the funds transfer pricing (FTP) mechanism:





All funds required for or resulting from the provision of bank's products are sourced (for asset products) from / deposited (for liability products) to Treasury via an internal loan / deposit funding transaction. Treasury manages prices of these internal funding transactions by controlling the liquidity premium curve used to price these transactions on top of the bank's base funding rate (interbank swap rate), which together comprise the FTP rate.

Treasury maintains different liquidity premium curves for different type of products to reflect their specific impact on banks funding requirements. At minimum, Treasury maintains a positive LP spread between the FTP rate paid by Treasury for funds provided by liability products (e.g. client deposits) and FTP rate charged by Treasury for funds used by asset products (e.g. corporate loans). Funding surplus from the LP spread provides for the costs of managing the bank's funding and maturity mismatch on the financial market.

On the business side, FTP price provides a base for pricing of the product for a client. For example

- FTP rate for liabilities provides a cap rate for client deposits – i.e. to realize a profit the branch must pay client lower rate on their deposit.
- Vice-versa, FTP rate for assets provides a floor rate for client loan – i.e. the branch must charge the client a higher rate to realize any profit. Moreover, for assets this profit margin must provide for a credit risk implicit in the loan (credit margin), so to realize any profit, a branch must charge a client rate that is higher than $FTP + \text{credit margin}$.

Note: XVA / FVA derivative pricing is managed centrally in RMB by BRM department and is not subject of this document. BRM funding approach will be defined in more detail in the BU specific chapters later in this document.

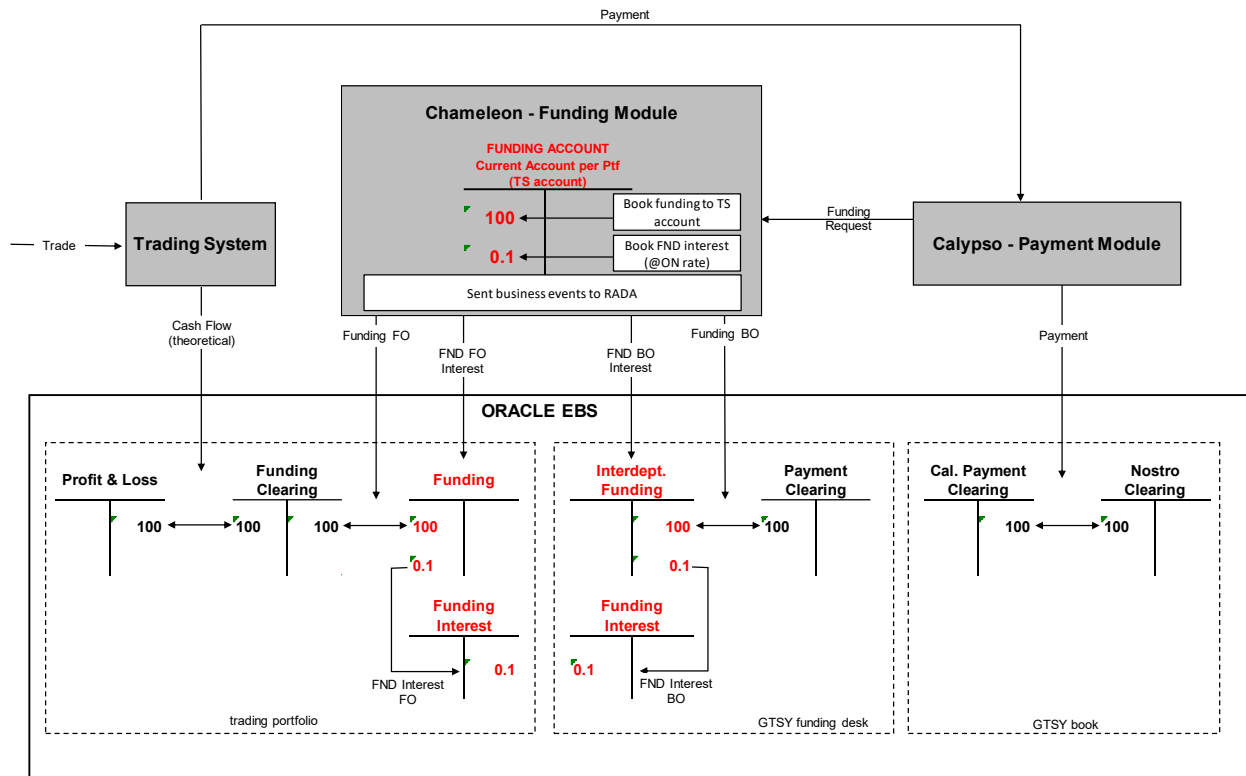
3.2 Current RMB funding solution

RMB SA currently uses 'cash-based funding' comprising from:

- Residual cash funding: each portfolio has a dedicated funding account set up per currency in Chameleon (TS call account) that maintains balance of the funds flowing from and into the portfolio – i.e. portfolio funding balance. All settlements on the portfolio (internal and external) must be affected through this TS account. A portfolio is charged / paid overnight funding interest for the EOD ZAR balance on its TS account (foreign currency balances are not charge interest), with the contra funding benefit / cost posted to the central GTSY funding portfolio. Funding interest is accrued throughout the month in Chameleon and capitalized at the end of each month. This process is outlined in the diagram below.
- Maturity match funding: currently executed in two different ways:
 - Physical one to one match trade capture: Upon capture of the market trade, business captures manually corresponding match maturity funding trade against the GTSY funding portfolio at internal FTP rate, including liquidity premium.
 - Monthly liquidity premium pay-over: in situation where manually capturing match trades is not practical, the trades that are to be match maturity funded are funded primarily overnight over TS account, with a swap to the bank's funding rate @JIB03. Once a month Finance calculates for each trade liquidity premium corresponding to its tenure at GTSY FTP rate and pays net liquidity premium over to GTSY funding portfolio.



The following diagram outlines current RMB residual cash funding solution with Chameleon being the central cash funding engine (the funding interest is currently being charged only for ZAR funding balances, no interest is charged on the FCCY funding balances):



Open point: outline current funding solution for London branch.

3.3 Product coverage of to-be FTP RMB funding solution

The new RMB funding process outlined in this document will cover the following products / transactions:

- Products / transactions captured on the FNB platforms will be funded via FNB IDGF funding process in FICS. This concerns primarily Corporate Bank business, part of which is managed on the FNB platform.
- Products / transactions captured on the RMB platforms will be funded via new RMB funding solution outlined in this document.

3.4 Organizational coverage of to-be FTP RMB funding solution

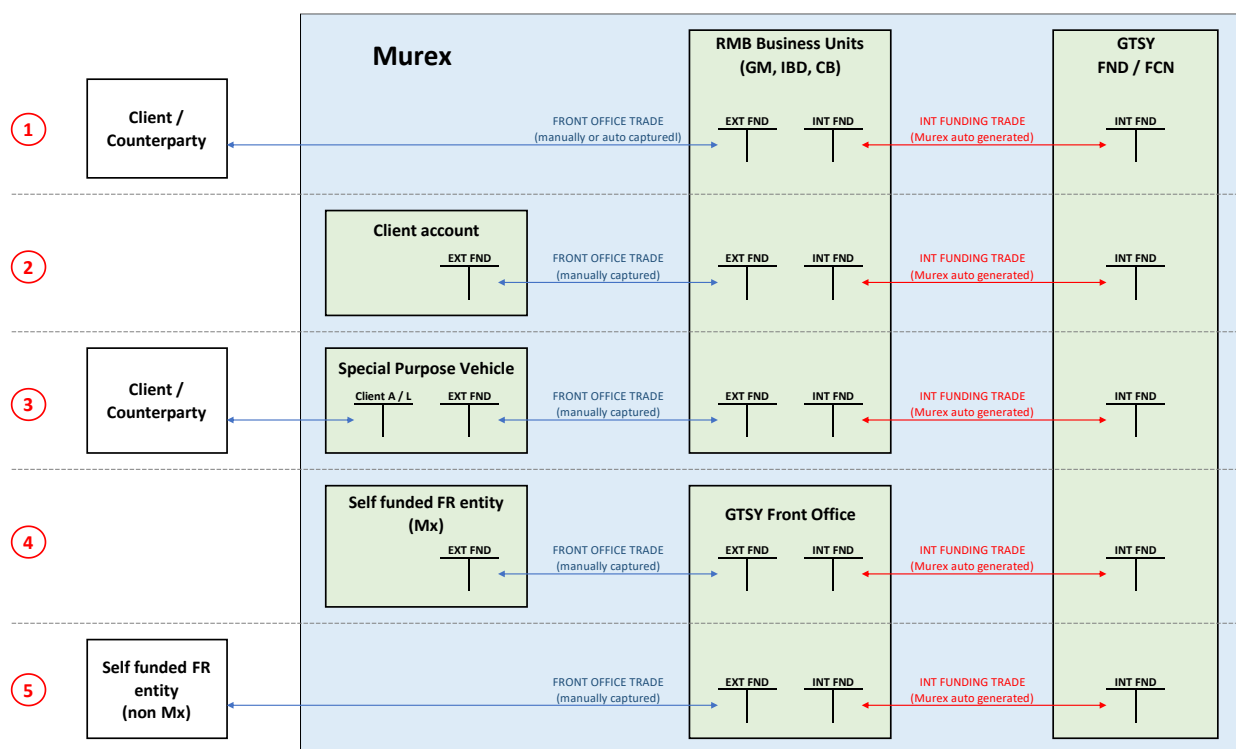
Murex will support variety of FirstRand related entities, as well as brokerage clients that hold products supported by the platform. These entities / clients will have dedicated portfolios set up in Murex GOM, but not all of these will be subject of the automated FTP funding process defined in this document.



From funding perspective entities in Murex can be split into four categories:

1. **Treasury departments (GTSY):** treasury departments will use Murex as its core funding engine for RMB business activities, including management and execution of the daily FTP funding process defined in this document, position keeping on the liquidity mismatch portfolios and accessing external liquidity via its own Mx front office portfolios. Murex will support two GTSY departments: GTSY ZA and GTSY London Branch.
2. **Entities funded by GTSY:** These are RMB business units – GM, IBD and Corporate Bank – operating under FirstRand Bank Ltd banking license. These entities have direct access to the funding from GTSY. Their business activities will be funded in Murex automatically using the FTP funding processes defined in this document.
3. **Self-funded FirstRand entities:** These include FirstRand entities legally outside of FirstRand Bank Ltd (individual entities in this group are listed later in this chapter). Some of these will have a portfolio in Murex but will not be funded using the Murex automatic FTP process as they manage their own funding needs. The entities may request funding from GTSY on ad hoc basis and this will be facilitated via external funding trade between the entity and GTSY front office portfolio. GTSY front office portfolio will be funded automatically in Murex against the GTSY mismatch portfolios in funding book.
4. **Brokerage clients:** brokerage clients, portfolio of which is administered by RMB. These include Prime Broking and RMB Morgan Stanley clients. These clients will have portfolios set-up in Murex to keep record of their positions. These portfolios will not be funded in Murex using automatic FTP process. Clients will self-fund by either depositing their own funds in RMB, or by sourcing funding from RMB using approved credit line. Once sourced these funds will be reflected on client portfolio in Murex, as well as on RMB business portfolio that will hold these funds as client deposit.

The following diagram illustrates different types of entities in Murex and their respective funding processes:



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Legend	
	Murex
	Entities managed on Murex in dedicated portfolios
	Entities managed outside of Murex
←→	Automatic Murex funding (defined in this document) of the entities funded by GTSY
←→	Manual ad-hoc funding of self funding entities effected through front office trade between FO portfolio and the entity

As described and shown above, entities in Murex will be funded in two different ways process:

- Automatic Murex FTP funding (as defined in this document).
- Manual ad-hoc funding via external trades:

Geography	Treasury	Entities funded by GTSY	Self-funded FR entities	Self-funded brokerage clients
London branch	FR Bank - London GTSY (OE.FRB LTD-LND)	FRB - IBD (OE.RMB LONDON)	FirstRand Securities (OE.FRSECURITIES)	
		FRB - GM (OE.RMB LONDON)		
South Africa	FR Bank - SA GTSY (OE.FRB LTD)	FRB - CB SA (OE.RMB SA)	RMB AUST (ES.RMB.AUST)	PB Clients (ES.PBCLIENTS):
		FRB - IBD SA (OE.RMB SA)	RMB Futures Clearing (ES.RMB.FC)	ACUMEN
		FRB - GM SA (OE.RMB SA)	Ashburton	CORONATION
			OE.ASHCISMCO	DISCOVERY
			OE.ASHFNDMAN	FAIRTREE
			OE.ASHMANCO	INDEPENDANT ALT
			OE.ASHMULTISS	KADD
			FR LTD:	MATRIX
			OE.FR LTD SA	SANLAM
			OE.FR ST INS	SOUTHCHEST
			OE.FRB INV HLD	SOUTHEASTER
			OE.FRL LTD	TANTALUM
			OE.RMB ASST FIN	TEREBINTH
			OE.RMB INV&ADV	TRINOMIAL
			FR SECURITZ	
			OE.FR AUTOREC	
			OE.NITROSEC	
			RMB AFF	
			OE.MORGANSTAN	
			OE.RMB STK OP	
			OE.RMBSEC	
			RMB SPVs	
			OE.BERGG CREDIT	
			OE.FR FIN COM	
			OE.FRESCO	
			OE.INDWA INV	
			OE.INGUZA INV	
			OE.INKOTHAINV	
			OE.INTERPRF INV	
			OE.IVUSI INV	
			OE.MAKLNI HLDGS	
			OE.MERBND	
			OE.PRC LEXSHL	
			OE.RAKEVEST	
			OE.RMB PRPHLDC1	
			OE.RMB PRPHLDC2	
			OE.RMB PRPHLDC3	
			OE.RMB.AFGRI	
			OE.SYZIGUM TD	



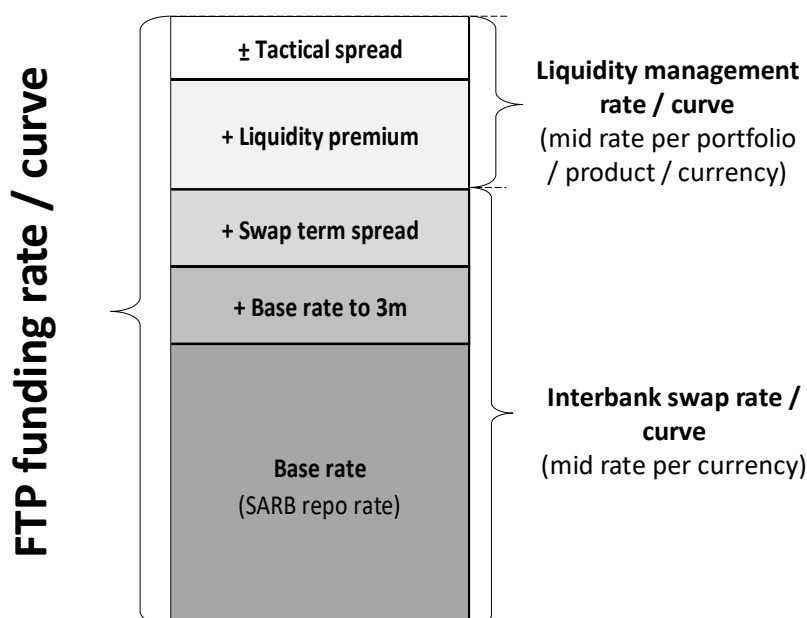
4. TARGET FUNDING SOLUTION OVERVIEW

This chapter provides a general overview of the new RMB funding solution.

4.1 FTP rate / curve components and granularity

Matched maturity funding method is based on FTP rates / curves that are owned and controlled by GTSY. To manage bank's liquidity, GTSY must be able to utilize a **specific FTP rate/curve per unique combination of instrument, portfolio and currency**. As a principle each asset/liability will be funded in the currency of the underlying asset/liability.

The following diagram outlines RMB funding rate/curve and its components:



FTP funding rate / curve will consist of the following components:

- **Interbank swap rate / curve (ISR):** Market interest rate matching maturity of the original asset/liability. Built off the following components:
 - Base rate: highest risk-free level of return from fungible instrument – SARB repo rate.
 - Base rate to 3m: swap base rate to 3-month duration (repo to JIB03 basis).
 - Swap term spread: cost of fixed rate hedge applicable on fixed rate transactions. It represents a swap of the 3-month rate to the rate appropriate for the term (maturity) of the underlying asset/liability.

GTSY will use one interbank swap rate /curve - mid rate - per currency for FTP curves construction. Two base currency interbank swap rates/curves will be set-up – one for ZAR and one for USD. Other currency rates/curves (i.e. non-ZAR and non-USD) will be derived from USD one using XCCY swap.



- **Liquidity management spread / curve:** Spread over the interbank swap rate charged or rewarded on top of the ISR based on liquidity characteristics of the underlying asset/liability. GTSY will manage this curve and it will consist of two components:
 - Liquidity premium (LP): covering standard liquidity characteristics of asset/liability (maturity, HQLA, etc.). Different liquidity premium rates/curves can be set-up for different products (e.g. different types of asset), portfolios and currencies.
- **Tactical spread:** from time to time on ad hoc basis GTSY may use tactical spread to incentivize target risk profile. This spread is not part of the curve, but rather set-up for specific combination of portfolio / product / counterparty and added / subtracted to / from the liquidity premium.

Statutory charges are not going to be part of the FTP rate/curve and will be calculated and charged out to business units by GTSY monthly in a separate process (similar to the current liquids charge outs).

General principles guiding RMB FTP curve construction:

- GTSY will leverage interbank swap curves maintained by GM. To construct the FTP curve GTSY will always use the mid-rate from these curves as a base funding rate, regardless of the underlying trade/position direction (buy/sell).
- Liquidity Premium (LP) curve will be controlled by GTSY. GTSY will set-up all LP curves as mid curves, with bid/offer bps specified for each curve. Bid/offer LP rates will be used for the FTP pricing on top of the applicable base rate (always mid).

Note: target solution in Murex must ensure sufficient control & validation of the FTP pricing (e.g. review and approval of FTP curve before being released in the system) to prevent mis-pricing of the funding transactions.

4.1.1 FTP curves for SA GTSY

SA GTSY will maintain specific sets of LP curves for currencies as follows:

- ZAR: Dedicated set of LP curves for ZAR
- USD: Dedicated set of LP curves for USD
- Other than USD (RMB mostly trades G8 currencies): System will generate FTP rate for other currencies on the fly off the USD curve applying up to date XCCY Swap rate between the underlying currency and USD. Apart from USD, system will not physically maintain curves for FCCY currencies.
- African currencies from RMB subsidiaries/branches: FTP curves for these currencies will not be maintained in Murex. These subsidiaries/branches source/deposit their funding deficit/surplus directly with GM. These currencies will not be managed by SA GTSY.

SA GTSY will maintain the following set of LP curves for ZAR & USD:

- **Unsecured LP curves:** these will be used for non-HQLA products. GTSY will use three non-secured LP curves:
 - Asset LP curve to price unsecured assets (non-HQLA)
 - Liability LP curve to price unsecured liabilities (non-HQLA)
 - Derivative funding curve (FVA curve) – to price derivative.
- **Secured LP curves:** these will be used for HQLA assets.



- ZAR HQLA assets: RMB holds 6 levels of quality of HQLA assets in ZAR. Each level will have its own LP curve.
- USD HQLA assets: RMB holds currently 2 levels of quality of HQLA assets in USD. Each level will have its own LP curve.

4.1.2 FTP curves for non-SA GTSY functions in scope

List FTP curves required for non-SA GTSY functions (London, FRS?, anything else?)

4.1.3 MTM revaluation of funding transactions

Key principle: the FTP curve used for pricing of the match maturity funding transactions, will be also used for MTM revaluation (discounting) of these transactions throughout their lifecycle. The exceptions to this rule will be specified explicitly in the BU specific chapters later-on in this document.

The above principle applies also in the case of non-US foreign currencies, where the system will discount the funding leg in FCCY using USD curve and swap it over to the underlying currency using XCCY swaps.

For overnight position funding, Murex will use OIS curve.

4.2 FTP processes

The target solution will run three distinct funding methods / processes:

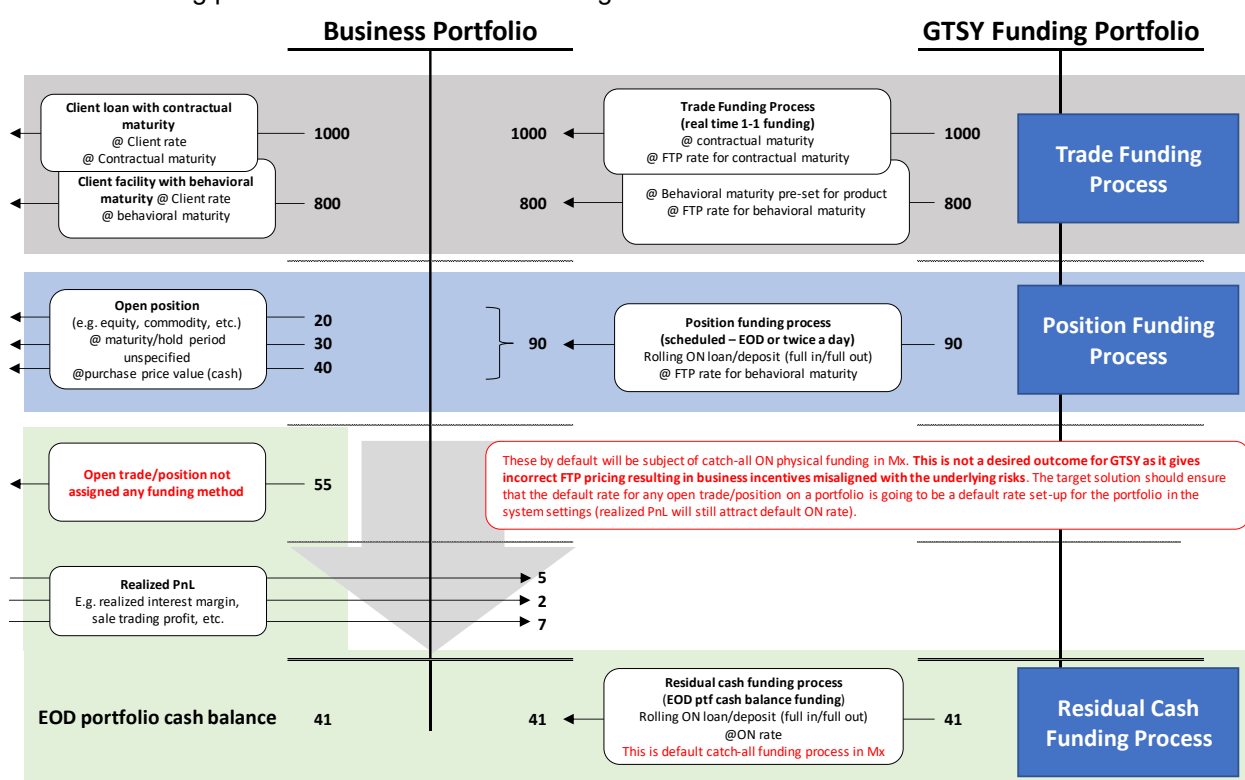
- ❑ **Trade funding process**: Real time, 1 – 1 match maturity funding process, where the system automatically generates an internal funding transaction with matching cashflow profile and maturity at an FTP rate corresponding to the underlying transaction's maturity.
- ❑ **Open position funding process**: scheduled process that will run at minimum once at the end of the day (can be run multiple times) which will fund open position on a portfolio – i.e. full open position except realized PnL cash, overnight @ predefined behavioural rate. The system must allow to switch this process ON/OFF for specific portfolio and product combination. In terms of FTP pricing, the system should allow to define different behavioural maturity per currency, product and portfolio, and then use this maturity to assign the FTP rate off the appropriate FTP curve. There will be two variants of this process, configurable in the system:
 - Funding of the present value of open position: in this configuration, the process will fund full present value of the open position in specific product on specific portfolio. PV funding in effect funds open cash position (capital / nominal / principal) associated with that position, as well as unrealized PnL of the position resulting from the current market rates. Funding unrealized PnL represents exchange of cash collateral between GM desk and funding desk (BRM) @ behavioural rate (per currency, product & portfolio).
 - Funding of the open position's cash: in this configuration, the process will fund cash associated with the open position, i.e. capital / nominal / principal, excluding the realized PnL cash. This funding will be also done separately for each underlying currency @ behavioural maturity specific for that currency, product and portfolio.
- ❑ **Residual cash funding process**: Scheduled process that will run at end of the day as the last of the funding processes. This process will fund overnight @ overnight rate all residual cash left on



the portfolio after the prior two processes were run. The aim is to set-up the prior two funding process so that the only residual cash left to be funded by this process in portfolio is realized PnL.

These processes run in a logical sequence, with the trade funding process running on a real time basis throughout the business day, position funding processes running at scheduled times during the day, and residual cash funding running at the end of the day to cater for any cash left after the prior two processes (catch-all default funding). GTSY has a strong preference for a solution set-up, that will ensure that all cash related to open positions except realized PnL would be catered for (and hence FTP priced) either by the trade funding or by position funding, and residual cash funding will cater only for realized PnL cash.

The three funding processes are outlined in the diagram below:



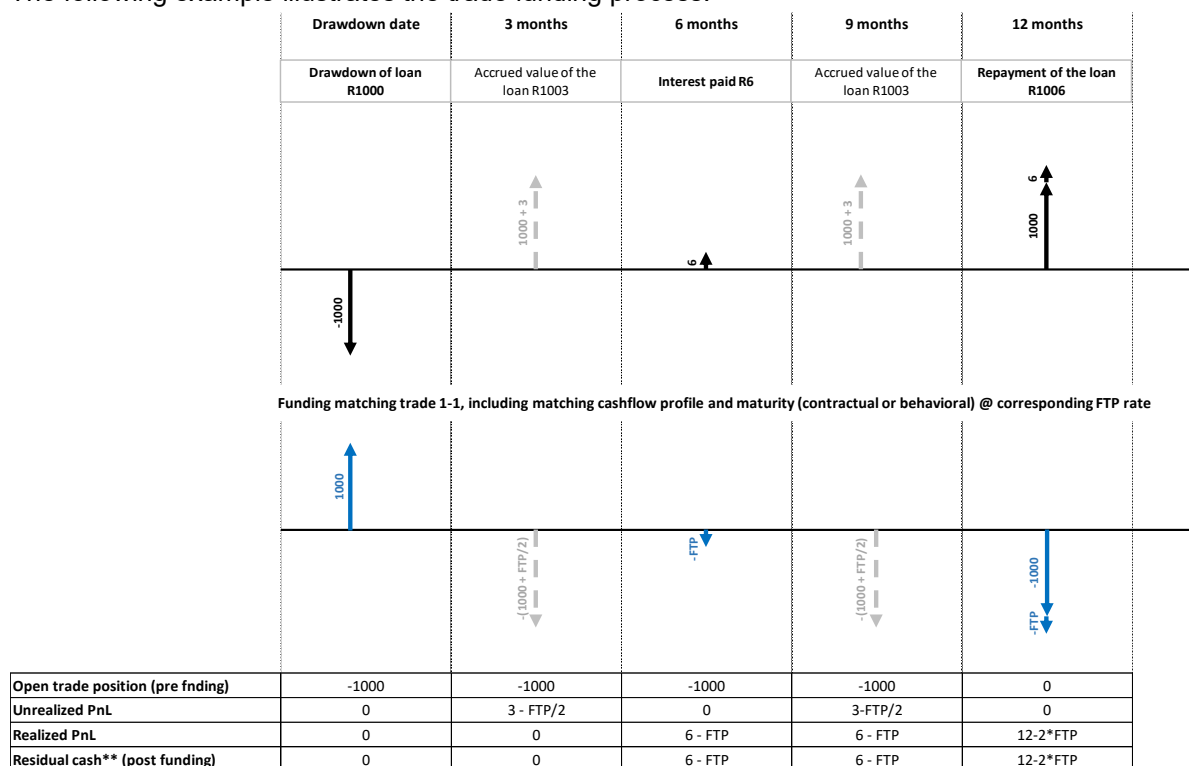
4.2.1 Trade funding process

Real time, 1 – 1 match maturity funding process, when the system automatically generates for each captured trade assigned to this funding method, a dedicated internal funding transaction with matching CF profile and maturity at an FTP rate corresponding to the underlying transaction maturity. A mirror of the funding transaction is posted automatically to GTSY mismatch portfolio. The system will use either contractual maturity of the underlying instrument, or behavioural maturity set-up for that instrument / portfolio combination.

This is the only process of the three done on 1 – 1 basis and the only one where the maturity of the underlying trade drives the FTP price, as well as maturity of the funding trade.



The following example illustrates the trade funding process:



**Any residual cash left over after the trade funding process above will be subject to the EOD residual cash funding process. PnL resulting from that process is not reflected in the table above

4.2.2 Position funding process

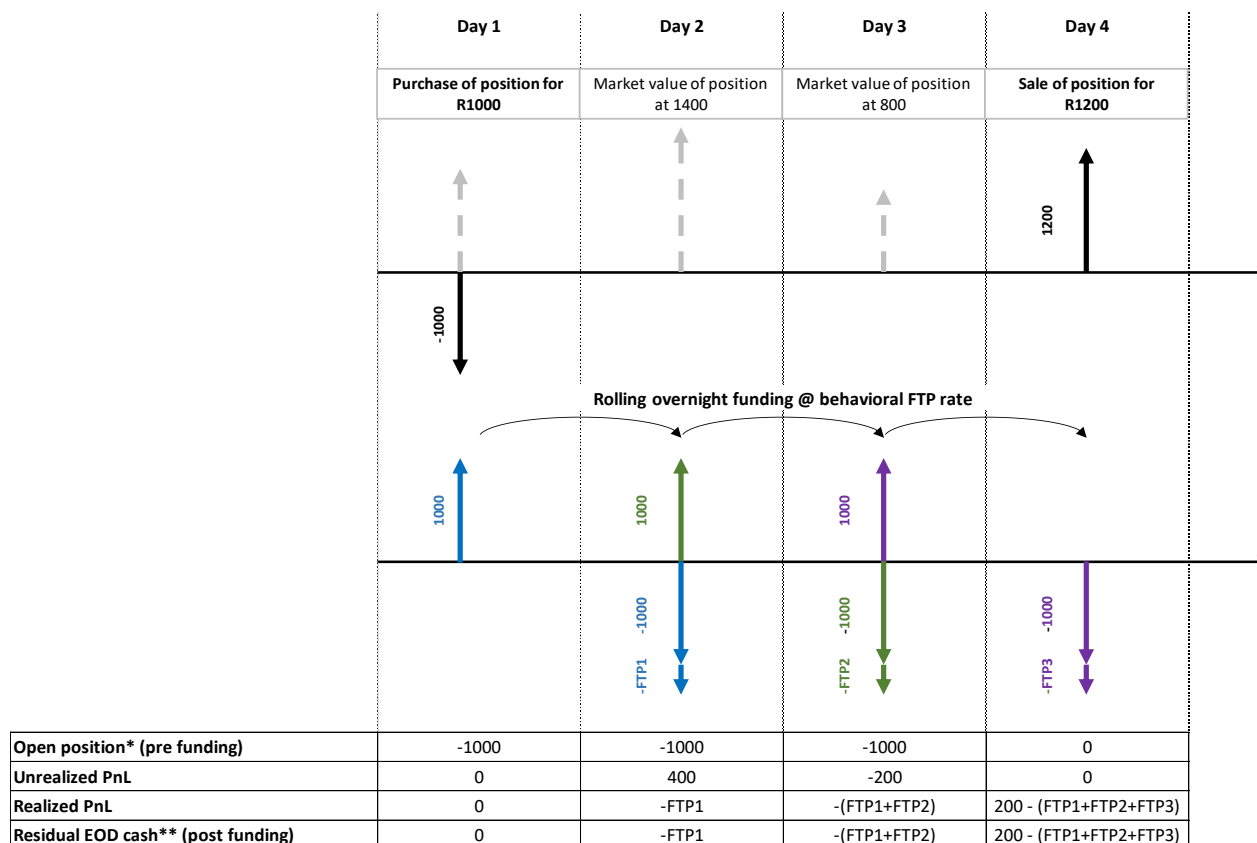
This is an end of day process that will fund at a predefined behavioural rate any open trading / banking portfolio positions that weren't funded by the real time trade funding process. This process funds cash related to open positions, which includes nominal / capital settlements (e.g. settled purchase of open bond position, drawdown of a loan, etc.), but excludes all realized PnL cashflows, which will be subject to later residual cash funding process. Murex will use its cash flow typologies (e.g. interest, capital, etc.) to differentiate open cash position (e.g. capital) from the realized PnL (e.g. interest). These typologies will have to be implemented also for simple cash flows that will be used to settle cash flows from other source systems, such as ACBS or Osiris.

The system will aggregate all open cash positions (as defined above) for each portfolio with position funding switched on at the end of each day, and automatically generate rolling ON funding transaction @ FTP rate corresponding to the behavioural maturity set-up for that portfolio in the system.

In principle this is the same funding method as residual cash funding, when funding is rolled over every night between the trading / banking portfolio and GTSY via overnight funding deposits/loans. However, the key difference is the FTP funding price: while residual cash funding always uses the ON funding rate, position funding enables to price funding according to the behaviour of the underlying cash position. As such, GTSY prefers to use this method for open cash positions that weren't catered for by trade funding, as it more realistically prices the actual funding costs incurred.



The following example illustrates the position funding process:



* The example above works with stable open position over the depicted period. In real world the open position may change every day and the funding will always reflect the up to date EOD open position on the portfolio.

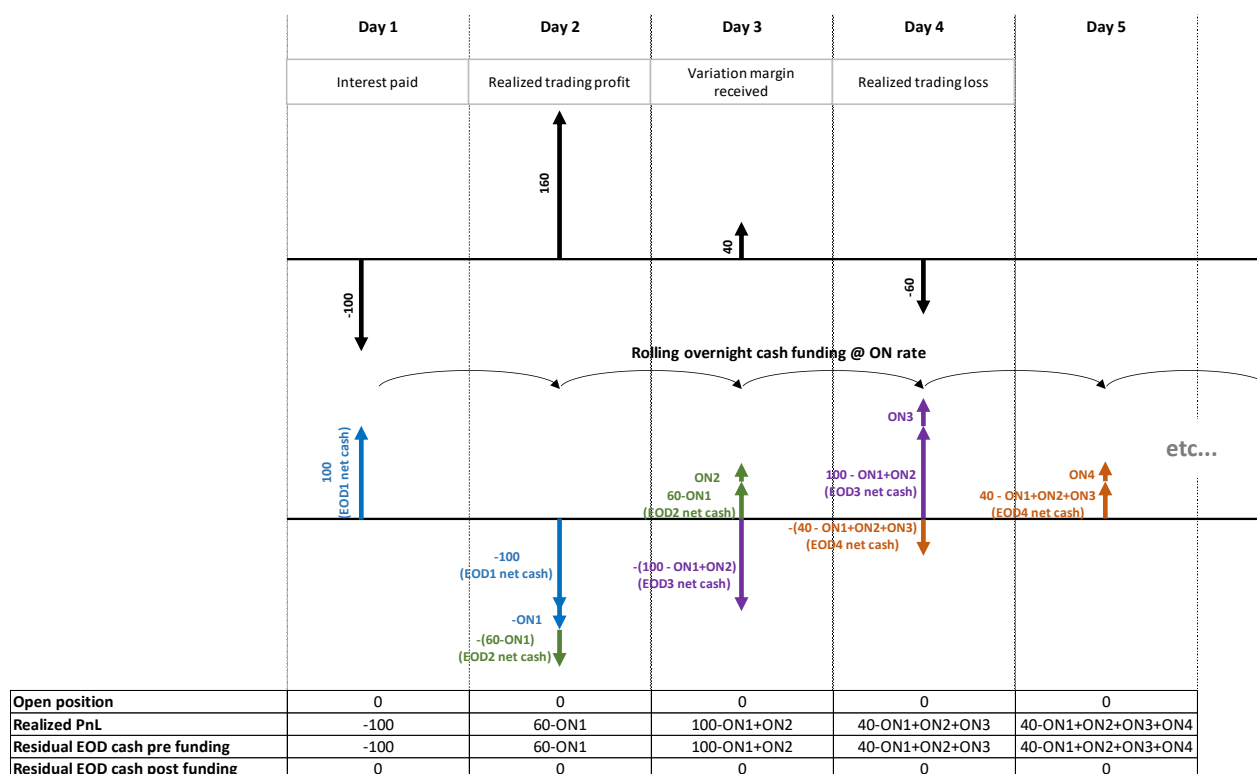
**Any residual cash left over after the trade funding process above will be subject to the EOD residual cash funding process. PnL resulting from that process is not reflected in the table above.

4.2.3 Residual cash funding

The default funding process will run at the end of the day after the position funding process and will fund overnight at an ON rate all residual cash left over after the trade funding and position funding processes were run. It is a default catch all method in Murex - i.e. should the other two processes not be activated for a portfolio, all cash on that portfolio will be funded via the residual cash funding process. Hence ON rate is the default funding rate in Murex.

GTSY prefers to use this method only for realized PnL cash (unless specified differently) and all other cash to be funded either via trade funding or position funding at the contractual / behavioural rates.

The following example illustrates the residual cash funding process:



Note: While the process above is in principle similar to the current 'cash-based' funding on TS account in Chameleon as it charges an overnight funding rate on an overnight cash position. However, there is one important distinction: Murex will capture at the end of every day a new ON funding deposit/loan between each funded portfolio and the GTSY mismatch portfolio. This in effect means, that funding interest will be capitalized daily in Murex (as part of funding transaction settlement), instead of the current monthly interest capitalization in Chameleon.



As depicted above, the new RMB funding process will be split between Murex and RADA as follows:

- **Murex funding:** Mx will cover funding of all RMB business transactions & positions resulting from provision of banking and trading products by business units in scope. Mx will support all three funding methods identified in the prior section – trade funding, position funding and residual cash funding, and will select the appropriate method based on business rules set-up in the system and attributes of the underlying business transaction / position.
- **RADA funding:** RADA will cover funding of the operational cost allocated to the cost centres and portfolios directly in RADA. These will not be captured in Mx (and hence not funded in Mx) as Mx is not intended to support operational cost allocation functionality. Operational costs are the RMB costs not directly related to the trading/banking activities, such as phone bills, IT costs, refreshments etc. Costs related directly to trading / banking activities (e.g. brokerage fees) will be captured directly to the business portfolios in Murex and funded via Murex. RADA will fund the operational costs using the residual cash funding method – i.e. they will be funded overnight @ ON rate.

The following underpins funding of the business transactions & positions in Murex:

- All funding positions from business transactions & positions must be consolidated in Mx daily. Therefore:
- All business portfolios in scope must be set up in Murex for funding purposes, regardless whether some or all the business transactions on those portfolios are captured in different front office system (e.g. loans in ACBS, commodities in Osiris).
- All settlements of business transactions & positions, regardless of the originating front office system - must be reflected on portfolios in Murex to keep the funding positions up to date for funding purposes.
- Since all settlements of business transactions must be reflected in Murex for funding and since Murex is going to be also a settlement engine for front office transactions captured in Murex, we recommend that all front office systems route their payment settlements via Murex. This is not a hard requirement but will lead to a streamlined RMB architecture by eliminating duplicate processes and interfaces.

Following underpins funding of operational costs in RADA:

- All RMB's transactions, including business transactions from Murex and their funding will be reflected in RADA GL as it is the consolidated general ledger for the bank.
- However, there will be no overlap between Murex and RADA funding. Meaning that business transactions & positions funded in Murex will not be funded in RADA, even in case when funding process in Murex fails.
- This will be ensured in the GL by separating funding positions from Murex and funding positions from transactions captured directly in RADA (operational costs) on a different set of funding accounts. RADA funding process will only fund positions on the RADA funding accounts (RADA Assumed to Actual 'ATA' account).
- All settlements on RADA ATA accounts (used only for transactions captured directly in RADA and not funded in Mx) on cost portfolios, will be mirrored in dedicated GTSY RADA FND book in GL to reflect the GTSY side of RADA funding. This is analogous to the current mirroring of one physical TS account in business and GTSY funding portfolio.



- RADA funding process will pull daily EOD balances on RADA ATA accounts, calculate funding interest and post the interest back to portfolio in GL, with corresponding contra to GTSY RADA FND.

RMB complete open funding position is sum of funding position in GTSY Murex FND book and GTSY RADA FND book. This should equal the total RMB open funding position in GTSY Nostro book.



5. MUREX FUNDING SOLUTION

This chapter outlines in more detail Murex funding solution.

5.1 Murex funding integration principles

Centralized funding of business transactions & positions in Murex requires two types of integration with other front office systems that will not be replaced by Murex (e.g. ACBS, Osiris):

- Transfer of settlements to Murex for EOD funding: as described in the prior chapter settlements from all front office systems will have to be sent to Murex to consolidate daily EOD funding positions on all banking / trading portfolios. Murex will fund these positions using one of the EOD funding procedures – position funding or residual cash funding. Automatic interfaces for settlements from other front office systems to Murex will be implemented and these settlements will be captured in Murex as special type of simple cashflow transactions.
- Transfer of trades to be funded using real time trade matching method: trades captured outside of Murex that must be funded using trade matching method (e.g. IBD loans in ACBS) will have to be transferred to Murex to trigger automatic trade matching process. This will be facilitated by capturing transfer transaction in the originating system (e.g. ACBS) that matches the cashflow profile of the original transaction (e.g. in the case of client loan, the transfer transaction will be deposit with the same cashflow profile). Mirror transfer transaction will be then captured in Murex and will trigger Murex's generation of matching funding transaction against GTSY (please see below for an illustration of this process). This transfer transaction represents intra-portfolio transfer of funding requirement between the originating system and Murex.

The diagram below outlines the logical flow of integration between an external trading system and Murex to transfer a trade for trade match funding, as well as to fund and settle cashflows from the original transaction in Mx. The example depicts client loan in ACBS as the trigger of the process, but the same process will apply for any other transaction in any other non-Mx front office system, that requires trade match funding.

1. Client loan captured in ACBS. Cashflows from the loan are sent automatically into the same portfolio in Murex for funding and settlement. These cashflows are captured in Murex as specific simple CF transactions.
2. ACBS will generate automatically (if possible) offsetting FND transfer transaction - deposit in this case - with cashflow profile matching the profile of client loan. Cashflows from the FND transfer are sent automatically into the same portfolio in Murex for funding and settlement - in this case internal settlement.
3. Mirror of the ACBS FND transfer - loan in this case - is captured in Murex on the same portfolio. Ideally this process should be automated, when FND transfer in external source system is sent automatically to Mx which captures its exact opposite.
4. Upon capture of FND transfer transaction in Mx (transaction 3), Murex automatically generates in the portfolio match funding transaction using the FTP rate appropriate for the underlying instrument and cashflow profile (tenure). Murex may - depending on set-up - generate single funding transaction as well as combination of different funding transactions (e.g. deposit & IRS) to transfer funding and interest risk from original transaction to GTSY.
5. Murex automatically captures mirror of the match funding transaction in appropriate GTSY mismatch portfolio (GTSY mismatch portfolio structure and population rules will be defined in later chapters).





5.2 Murex funding processes overview

This section provides more detail on the three funding processes that will be run in Murex – trade funding, position funding and residual cash funding. These processes will run in sequence as follows:

1. **Trade funding process:** runs throughout the business day and picks up any new captured trade that qualifies for 1 – 1 match funding. Upon capture of new trade system automatically generates corresponding matching funding transaction at rate derived off the appropriate FTP curve and mirrors the funding transaction in the GTSY mismatch portfolio. Should the original transaction be modified during its lifetime, Murex ideally updates the match funding transaction accordingly in real time.
2. **Position funding process:** end of day process that aggregates a portfolio's open cash position (i.e. cash representing open trading positions, such as capital payments) and generates an ON funding transaction transferring the open cash position to the GTSY mismatch portfolio at behavioural interest rate, which is pre-set for given portfolio in Murex.
3. **Residual cash funding process:** end of day process that is run after the position funding process. This process aggregates any cash still left on a portfolio and generates an ON funding transaction transferring the residual cash to the GTSY mismatch portfolio at overnight rate. If the position funding process has been set-up correctly on a portfolio, the residual cash funding should only fund realized PnL and should not include any open cash position.

The diagram below provides illustration of the Murex funding processes in the following example:

Business transactions:

1. Internal money market transaction (loan/deposit) between portfolio A & portfolio B and between two different source systems where leg on ptf A is captured in external FO system and leg on ptf B in Murex. This trade doesn't have match funding set-up and will be subject of position funding process.
 - 1.1. Portfolio A's leg of internal trade captured in external system and settled in Murex
 - 1.2. Portfolio B's leg of internal trade captured and settled in Murex
2. Fee paid by portfolio A to an external counterparty, captured in an external system and settled in Murex. As a realized PnL event this will be subject to the residual cash funding process.
3. Client loan captured on portfolio B in Murex and settled in Murex. This loan is flagged for trade matching funding process.

Funding transactions:

4. Match funding for client loan (txn 3): upon capture of client loan Mx generates internal transaction against GTSY mismatch portfolio with matched cashflow profile @ FTP rate.
5. Funding of portfolio A's open position: transferring EOD open cash position (not residual cash) from portfolio A to GTSY via overnight transaction @ behavioural rate pre-set for portfolio A in the system.
6. Funding of portfolio B's open position: transferring EOD open cash position (not residual cash) from portfolio B to GTSY via overnight transaction @ behavioural rate pre-set for portfolio B in the system.
7. Funding of portfolio A's residual cash: transferring EOD residual cash left after position funding (txn 5) from portfolio A to GTSY via overnight transaction @ ON rate.
8. Funding of portfolio B's residual cash: transferring EOD residual cash left after position funding (txn 5) from portfolio B to GTSY via overnight transaction @ ON rate.

Note: Assume to Actual (ATA) accounts are the equivalent funding accounts in Murex subledger. There will be three ATA accounts on each Mx portfolio – 'ATA external' for settlements with external ctpy, 'ATA Internal Mx' for settlements of internal trades when both legs are in Murex and 'ATA Internal non Mx', for settlements of internal trades when one leg is captured outside Mx. Sum of balances on these 3 accounts



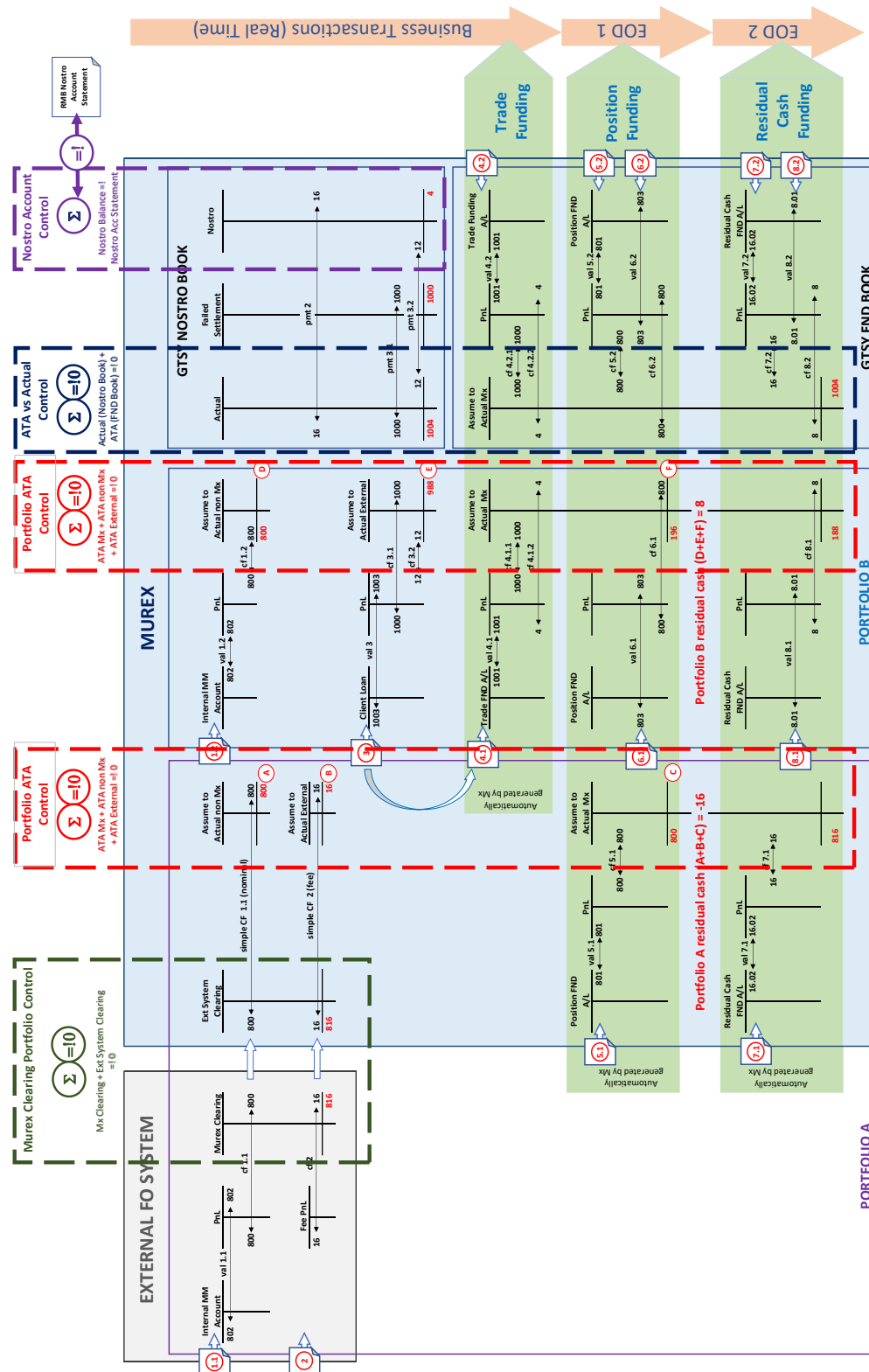
represents the funding/cash position on a portfolio and is subject to the funding processes described herein.





5.3 Murex funding controls

Following diagram outlines the controls to be put in place in the bank's finance architecture to ensure completeness, validity and accuracy of the bank's funding positions:





As shown above, the following controls will be implemented to control the funding process and positions from source transactions capture all the way to their settlements on the Nostro account or internal funding account:

- **Murex clearing account control:** Murex clearing account will be used to capture intra-portfolio cash transfers from external FO systems to Murex for funding and settlement. As these are intra-portfolio transfers, once the portfolio postings from external FO system and Murex are consolidated in RADA offsetting each other, this account must have at the end of each day 0 balance.
- **Portfolio ATA (funding) accounts control:** sum of balances on ATA accounts on a portfolio represents its cash position. Murex funding processes will sweep at the end of the day all cash from each portfolio into the GTSY mismatch portfolios – the portfolios that will in effect hold consolidated bank's cash position. Therefore, if the Murex funding processes run correctly, sum of ATA accounts' balances on each portfolio (except GTSY mismatch portfolios) at the end of the day must equal zero.
- **ATA vs Actual control:** 'ATA' (assume to actual) account is an account used on portfolios to capture cash position (i.e. the sum of cashflows on a portfolio) based on an assumption that all cashflows will be settled successfully. 'Actual' account is the account in GTSY Nostro book used to book all actual settlements in Murex – i.e. payments.
As the whole bank's cash position will be consolidated at the end of each day on the GTSY mismatch portfolio's ATA accounts, balance on ATA accounts (plus balance on the GTSY RADA FND book) must at the end of each day equal the balance on the 'Actual' account in GTSY Nostro book.
- **ATA Internal Murex control:** internal trades with both legs in Murex will not be settled against internal clearing account in GTSY Nostro book as is the case in RADA. There will be no payments generated for internally settled trades – only cashflows, which will be posted against dedicated 'ATA Internal Murex' account. Hence sum of balances on 'ATA Internal Murex' accounts across all portfolios must equal 0 at the end of each day.
- **Murex Nostro account control:** balance on the Murex Nostro account at the end of each day represents the settled RMB cash position. This balance will be reconciled daily against the RMB Nostro account statement from FNB.

To enable efficient root cause analysis of the issues identified by the controls above, the following reconciliations will be implemented:

- **Cashflow / Payment reconciliation:** this reconciliation will check that every external cashflow in Murex, has corresponding payment. The recon will be done at transaction level and leverage unique cross-reference to match corresponding cashflow and payment transactions. This recon is supporting control enabling for efficient identification of root cause of discrepancies identified during ATA vs Actual control.
- **Internal Murex cash-flows reconciliation:** this reconciliation will check that cashflows from internal trades where both legs are captured on Murex are netted off. The recon will be done at transaction level and leverage the unique cross-reference to match corresponding internal cashflow transactions. This recon is a supporting control enabling the efficient identification of root cause of discrepancies identified during ATA Internal Murex control.



- **Murex clearing reconciliation:** this reconciliation will check that every cashflow in an external system that funds via Murex, has corresponding simple CF in Murex. This recon is a supporting control enabling for efficient identification of root causes of discrepancies identified during Murex clearing account control.

In addition to the above subledger / GL controls, GTSY would like to have a report / view from Murex that will show split of trades / positions on the portfolio and their funding. E.g. list of trades that were match funded, linked to the corresponding funding transactions, open cash positions and their corresponding funding legs, as well as residual cash position and its corresponding funding leg.



6. RADA FUNDING SOLUTION

6.1 RADA cost allocation process

Operational cost allocation in RADA is the primary reason for necessity to build RADA funding process. The diagram below projects the current RMB cost allocation process (that may change) onto the new RMB architecture, including new postings in the GTSY RADA Mismatch portfolios.

The cost allocation process:

Daily posting expenses to cost centres

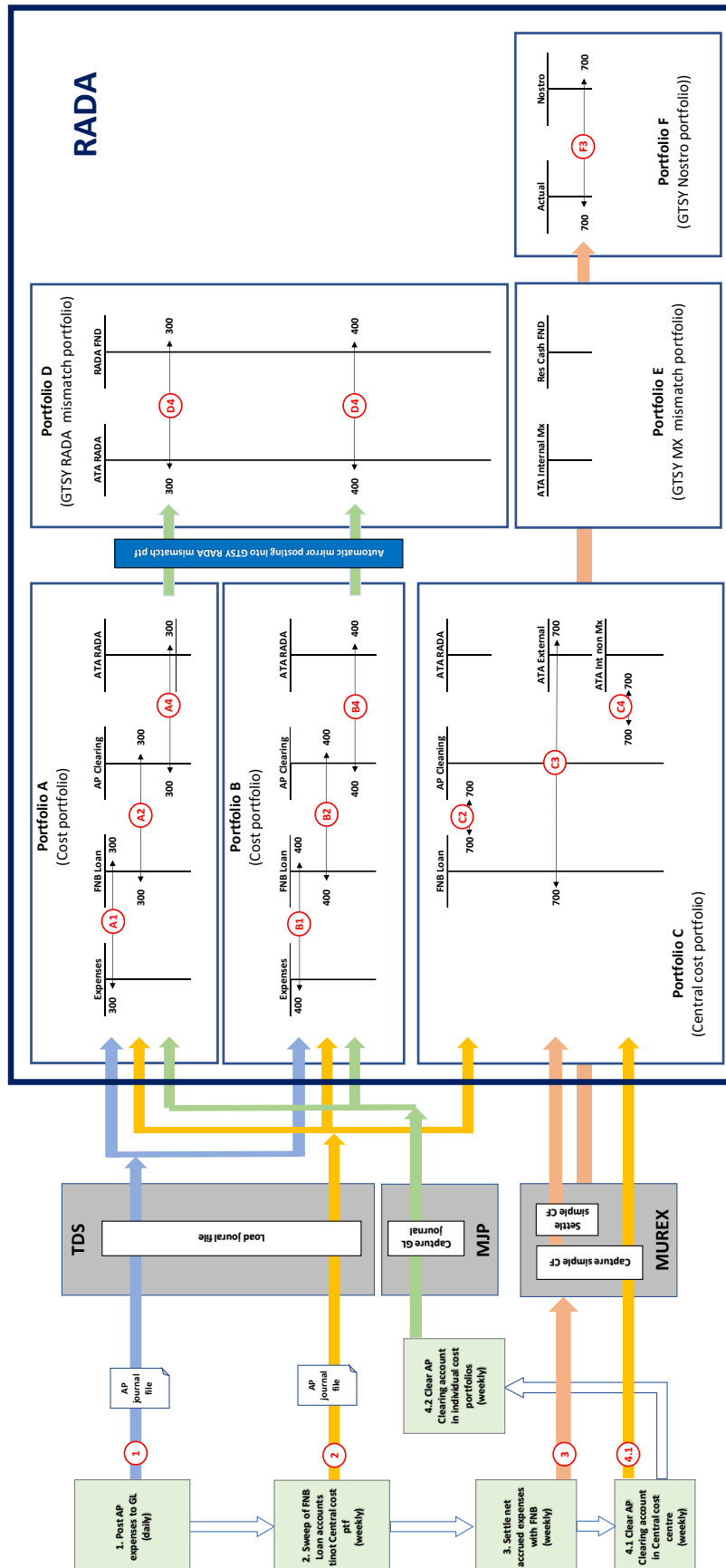
1. RADA operations post daily detailed expenses received from Oracle AP into individual cost centres in RADA. These expenses are captured in the GL and posted against the FNB Creditor account. Operations load the expense file received from AP to TDS which then posts the expenses to Oracle GL automatically.

Weekly settlement of accrued RMB expenses with FNB:

2. Once a week, RADA operations receive a file from Oracle AP that sweeps the FNB Creditor account from individual cost centres to a central cost portfolio that will be settling the total accrued RMB expense with FNB. Operations load the file into TDS, which is then processed into GL, clearing each FNB Creditor account balance against the AP clearing account on each portfolio.
3. Once a week, RMB settles the total accrued balance of RMB expenses with FNB by capturing and settling corresponding simple cash flows on the central cost portfolio in Murex.
4. Central Finance charges out the accrued payment from the central cost portfolio to the individual cost centres in MJP (Manual Journal Portal) based on their individual expenses. This clears the AP clearing accounts in individual portfolio and establishes the actual funding balances in each portfolio on ATA RADA account (RADA funding account).

To facilitate funding in RADA, all ATA RADA balances on cost centre portfolios must be mirrored in the GTSY RADA mismatch portfolio. Hence every posting on the RADA ATA account in cost portfolio must be mirrored (in the opposite direction) automatically on the RADA ATA account in the GTSY RADA mismatch portfolio. This is equivalent to the current TS account process in Chameleon, when every posting on a TS account is booked in the front office portfolio and mirrored in opposite direction on the GTSY FND book.

MJP application will have to be amended to support this automatic mirror posting of every cost funding (step 4 in the example below) into GTSY RADA mismatch portfolio. This will replace the current MJP funding interface to Chameleon.





7. GTSY SPECIFIC FUNDING SET-UP REQUIREMENTS

Following the overall RMB solution design outlined above, this chapter outlines business requirements for FTP process set-up specific to GTSY.

7.1 Structure of the GTSY funding book

This section defines required structure of the funding mismatch portfolios to be set-up in Mx for GTSY to manage RMB funding requirements efficiently. Murex will need to understand this structure to post funding legs generated by any of the three funding processes described above to appropriate GTSY funding portfolio.

GTSY manages FRB funding requirements in two currencies, ZAR and USD. Any other currency funding requirements (e.g. African subsidiaries funding requirements) are managed by GM, or (e.g. in the case of EUR loan provided in SA) are funded from the GTSY USD funding pool by swapping the originating currency funding transaction into USD using CCY IRS (see the following section for more detail).

GTSY will use two sets of portfolios manage separately RMB's ZAR and USD funding requirements. In addition to currency, GTSY requires to have the positions on its funding book split by:

- Term / Overnight: GTSY manages separate overnight and term funding pools. Therefore, all funding legs with overnight maturity will be posted to one set of portfolios, while all term funded legs (i.e. with maturity other than ON) will be posted to different set.
- Business unit: GTSY monitors / manages funding requirement per business units. Therefore, each RMB business unit (IBD, GM, CB) will have a dedicated set of portfolios in the GTSY funding book.
- Asset / liability: GTSY manages separates requirements for asset and liability funding. Therefore, it maintains separate portfolios for asset and liability funding requirements/legs.



To cater for the requirements, GTSY FND book will include separate portfolio for any combination of the above dimensions: currency / (term / ON) / business unit / (asset / liability). The following table lists portfolios that will comprise the GTSY FND book:

Currency	Term / ON	BU	Asset / Liability	Portfolio*
ZAR	Term	IBD	Asset	ZAR_TERM_IBD_ASSET
			Liability	ZAR_TERM_IBD_LIABILITY
		CB	Asset	ZAR_TERM_CB_ASSET
			Liability	ZAR_TERM_CB_LIABILITY
		GM	Asset	ZAR_TERM_GM_ASSET
			Liability	ZAR_TERM_GM_LIABILITY
	ON	IBD	Asset	ZAR_ON_IBD_ASSET
			Liability	ZAR_ON_IBD_LIABILITY
		CB	Asset	ZAR_ON_CB_ASSET
			Liability	ZAR_ON_CB_LIABILITY
		GM	Asset	ZAR_ON_GM_ASSET
			Liability	ZAR_ON_GM_LIABILITY
USD	Term	IBD	Asset	USD_TERM_IBD_ASSET
			Liability	USD_TERM_IBD_LIABILITY
		CB	Asset	USD_TERM_CB_ASSET
			Liability	USD_TERM_CB_LIABILITY
		GM	Asset	USD_TERM_GM_ASSET
			Liability	USD_TERM_GM_LIABILITY
	ON	IBD	Asset	USD_ON_IBD_ASSET
			Liability	USD_ON_IBD_LIABILITY
		CB	Asset	USD_ON_CB_ASSET
			Liability	USD_ON_CB_LIABILITY
		GM	Asset	USD_ON_GM_ASSET
			Liability	USD_ON_GM_LIABILITY

* Portfolio name is indicative - final naming convention may differ.

In addition to the above GTSY FND book portfolios, GTSY will use FRBPREFUND portfolio to fund preference shares' transactions.

GTSY FND book portfolios and FRBPREFUND will hold the RMB funding position and any funding transaction must end up in one of these portfolios.

However, in some cases the funding leg may be posted into in-between GTSY portfolios before being posted to GTSY FND book, to facilitate additional processing required, e.g.:

- to swap FCCY funding leg into base FCCY currency USD before posting USD FND leg into the target USD GTSY FND portfolio (see next section for more detail). For these purposes all non-USD FCCY funding transactions will be booked via GTSY portfolios dedicated to swapping these currencies to USD.
- to enable GTSY to benefit economically from IBD book prepayments (see 'IBD set-up requirements' section). For this purpose, all IBD funding will be posted against ASU / FSU GTSY portfolios first, and only afterwards passed on to the target GTSY FND portfolio.



7.2 Foreign currency funding process in GTSY

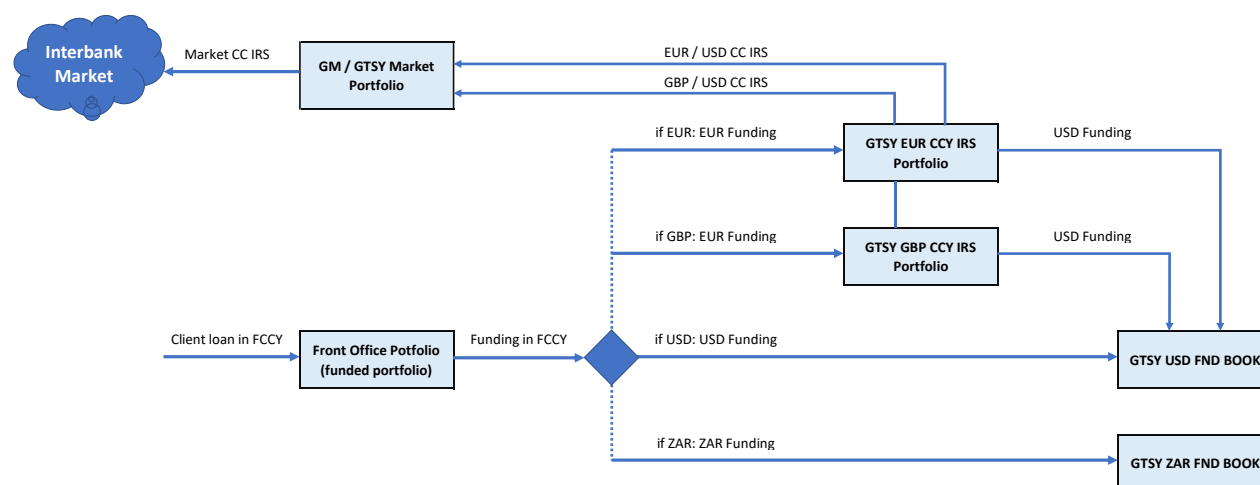
GTSY manages FRB funding requirements in two currencies, ZAR and USD. Hence ZAR transactions will be funded in ZAR from GTSY ZAR funding book and USD transactions will be funded in USD from GTSY USD funding book.

Transactions in other currencies will be funded on the originating portfolio in original currency from the GTSY USD funding book. Hence the funding transactions in original currency posted into the originating business portfolio must be swapped into USD funding before it can be posted in the GTSY USD funding portfolio. To facilitate this, the solution in Murex will facilitate in-between GTSY portfolio to:

- book mirror funding in original currency into, and
- swap the original currency funding into USD funding using internal CCY IRS against GM/GTSY market portfolio, and
- transfer the USD funding to the target GTSY USD funding portfolio.

There will be an separate ‘in-between’ GTSY portfolio for every currency potentially funded by SA and UK GTSY, which are mostly G8 currencies.

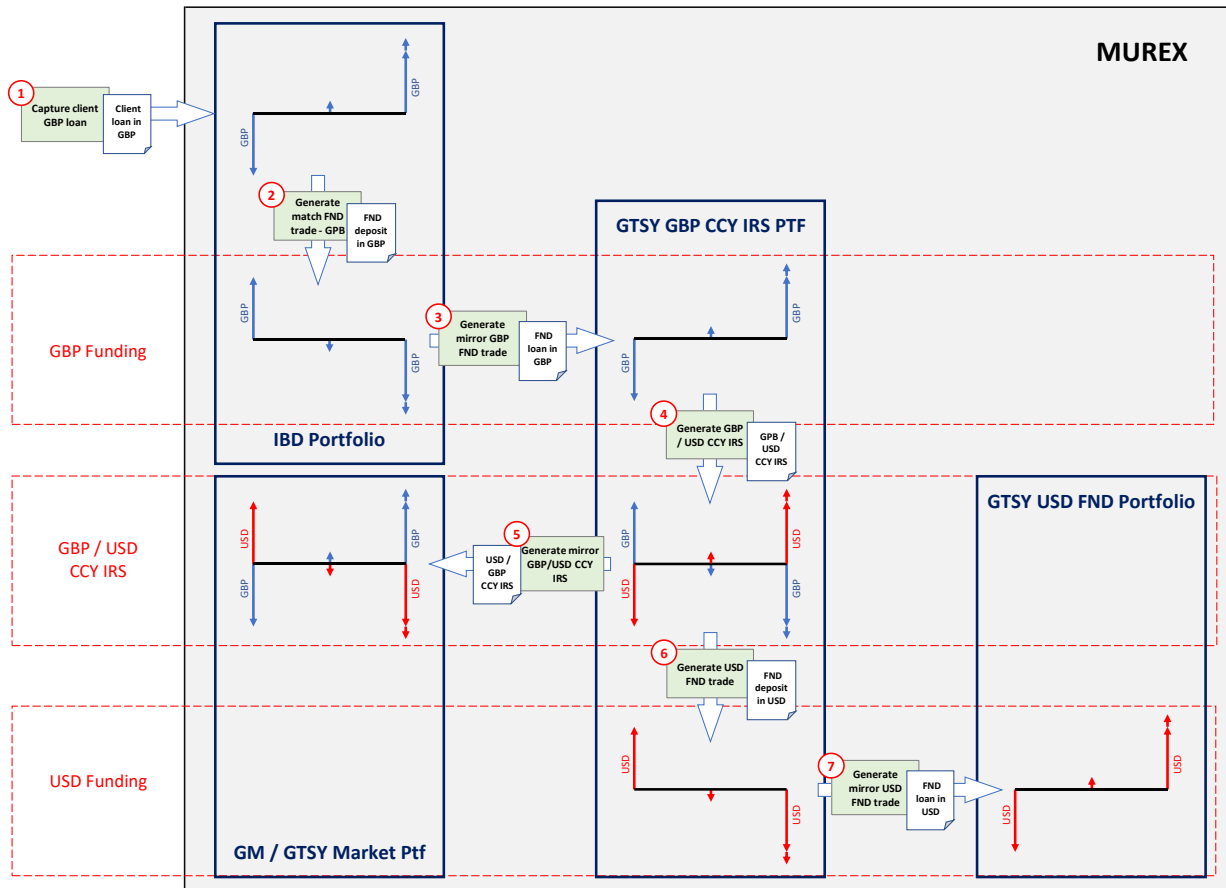
The following diagram outlines the funding processes for 4 different currencies – two base funded currencies ZAR & USD as well as for two non-base currencies – EUR & GBP:



USD and ZAR funding will be fully automated and straight-through process in Murex. Ideally, the funding process for other currencies, including cross-currency swap into USD in in-between portfolio should be automated as well.



The following diagram outlines the desired automated funding process in Murex for non-US FCCY currencies:



Process description:

1. Client trade denominated in GBP captured on business portfolio.
2. Upon client trade capture, Murex automatically generates matching funding in GBP @ appropriate FTP rate.
3. Murex automatically mirrors the GBP funding leg into GTSY 'in-between' swap portfolio for GBP – GTSY GBP CC IRS pts in the example above.
4. Upon capture of the mirror GBP funding in GTSY GBP CC IRS ptf, Murex automatically generates on the same portfolio internal CC IRS swapping the GBP profile to USD against a predefined GM / GTSY market portfolio.
5. Murex mirrors the CC IRS in the predefined GM / GTSY market portfolio.
6. Murex automatically generates USD funding transaction in the GTSY GBP CC IRS ptf, effectively squaring the portfolio to 0.
7. Murex mirrors the USD funding transaction from GTSY GBP CC IRS ptf in the appropriate GTSY USD funding portfolio.

Open question: How should the transactions in GTSY FCCY CC IRS portfolio be priced and valued – using what rates, curves and what are the objectives. I.e. is the objective that the GTSY FCCY CC IRS portfolio



at the end of the process has 0 PnI and 0 position? At what rate must the USD funding leg be captured – USD FTP rate? What is the price of the CC IRS?

7.3 Year end PnL Sweep process

Open point: outline planned year-end PnL sweep process in Murex and RADA.



8. IBD SPECIFIC FUNDING SET-UP REQUIREMENTS

This chapter outlines IBD specific requirements for funding solution set-up. It covers two topics:

- IBD match funding process;
- Valuation of IBD deals using valuation spread.

8.1 IBD match maturity funding process

While the principles and processes outlined earlier in this document apply to IBD, the trade match funding process in Murex must cater for the following IBD specifics:

- **Pre-agreed FTP rate:** FTP rate for an IBD deal is agreed upfront between IBD and GTSY as part of the deal conclusion forum and may differ from the FTP rate valid in the system at the time of deal capture. The automated trade matching process on IBD portfolios will have to allow an IBD user to capture the pre-agreed FTP rate on the original transaction (e.g. loan) and generate match funding transaction automatically at this rate, rather than the FTP rate current in the system at the time of the funding capture.
- **Centralized management of the IBD interest and prepayment risk by FRM function in dedicated GTSY book – ASU / FSU:**
 - Centralized management of the IBD interest risk: IBD deals are 'immunised' – i.e. interest risk from these deals is transferred to central GTSY book (ASU/FSU portfolios), where the risk is managed on an aggregate basis to realize economic value for FRB. Hence ASU / FSU portfolios act as an intermediary between IBD portfolios and GTSY funding book (FND/FCN) swapping client deal's reference rate into bank's funding rate. ASU / FSU pools interest risk resulting from IBD deals and manages the aggregate risk centrally.
 - Centralized management of the IBD client prepayment risk: Most IBD deals provide clients with an option to break / prepay the deal early. FRM function manages centrally risks associated with the client deal prepayments and materializes resulting breakage costs / benefits. These include IR hedge breakage costs / benefits, as well as funding breakage costs / benefits.
 - Centralized materialization of IBD funding benefit: IBD and GTSY have agreed that GTSY will pay IBD 33bps off its liquidity premium on each deal funding to reflect the change of the base funding rate for IBD from IDTRF to JIB03. This benefit will be accrued for IBD centrally and not be allocated to the individual client deals.

A version of the ASU / FSU processes described above will need to be implemented in Murex for IBD. These processes will utilize: the following portfolios:

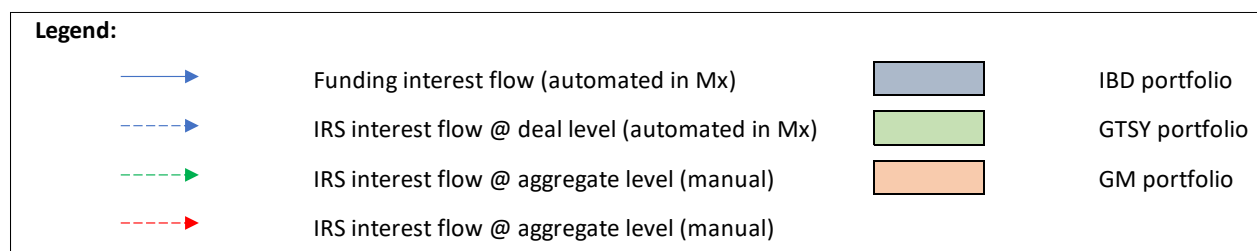
- IBD deal portfolio: business portfolio, housing client deal, its match funding and IR hedge. The portfolio accrues client deal margin over the lifecycle of the deal.
- IBD ringfenced portfolio: IBD and GTSY has agreed that GTSY will pay IBD 33bps off its liquidity premium on each deal funding to reflect the change of base funding rate for IBD from IDTRF to JIB03. IBD ringfenced portfolio will accumulate this IBD benefit across individual IBD deals.
- ASU / FSU funding portfolios: GTSY portfolios used to monitor and manage centrally IBD deals' funding breakages. All IBD funding is routed via these portfolios and FRM department uses these portfolios to control the IBD deal breakages and to materialize funding breakage costs / benefits. ASU portfolio is used to manage funding breakages of amortised cost deals / portfolios, while FSU is used to manage funding breakages of FVTPL IBD deals / portfolios.



- ASU / FSU IR hedging portfolios: GTSY portfolios used to manage centrally interest risk from IBD deals. The IR risk from IBD deals is pooled in these portfolios and hedged economically on aggregate level. FRM department also materializes IBD deal hedge breakage costs / benefits through these portfolios. ASU portfolio is used to manage IR from amortised cost deals / portfolios, while FSU is used to manage IR from FVTPL IBD deals / portfolios.
- GTSY FND / FCN books: GTSY mismatch portfolios for bank's funding requirements. FCN book is used for ZAR funding, while FCN book is used for FCCY funding.
- GM market portfolio: Global markets portfolios that facilitate market hedging of the IBD interest risks from ASU/FSU portfolios.
- GTSY Capital portfolio: GTSY portfolio holding bank's after-tax capital that can be utilized to fund preference share deals at preferential interest rates due to tax gross-up benefit realized by the bank.

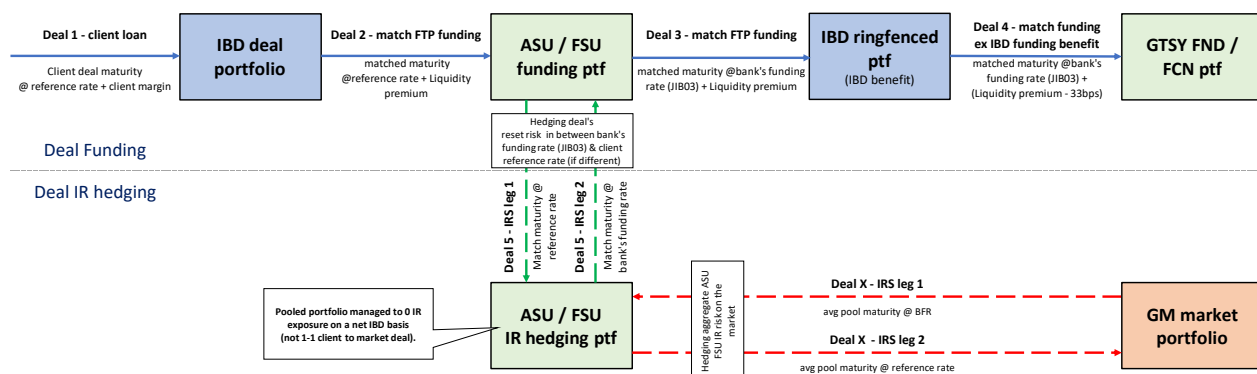
Solution in Murex must cover the following four distinct processing scenarios:

1. Floating rate loan / bond
2. Fixed rate loan / bond
3. Prime rate loan
4. Preference shares
5. Behavioural funding



8.1.1 Floating rate loan / bond

The following diagram outlines target funding process for floating rate loans / bonds (with exception of prime rate products):



Key points:

- Deal 2: Client deal on IBD Deal portfolio will be funded from ASU / FSU funding portfolio @ client reference rate which will transfer fully interest risk to ASU / FSU funding portfolio.



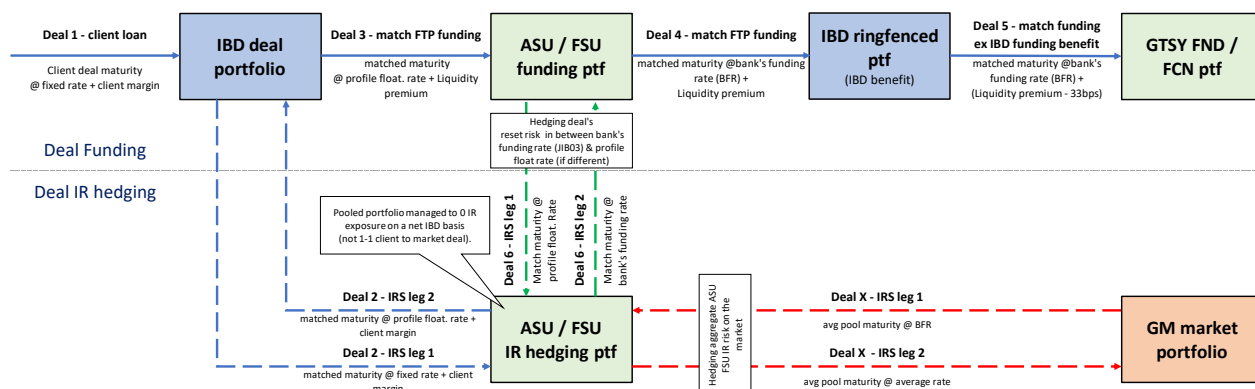
- Deal 3 & 4: ASU / FSU funding portfolio will be funded from GTSY FND / FCU portfolio @ bank's funding rate (JIBOR 03 for ZAR, LIBOR 03 for USD / foreign currency).
- Deal 5: FRM will manually hedge interest reset risk resulting from difference between the client reference rate and the bank's funding rate on the ASU / FSU funding portfolio with IRS against ASU / FSU IR hedging portfolio.
- Deal X: Interest risk on ASU / FSU Hedging portfolio will be managed at aggregate basis by FRM by manually executing interest swaps with GM market portfolio.

Murex automation requirements:

- Murex should automate generation of deals 2 – 4. These will be triggered by capture of the client deal in the IBD Deal portfolio in Murex.
- In the case of client deal break (e.g. early termination / prepayment), deal 2 should be updated automatically by Murex, while other deals (deal 3, 4, 5) should remain unchanged. These deals will be modified manually by FRM.

8.1.2 Fixed rate loan / bond

The following diagram outlines target funding process for fixed rate loans / bonds:



Key points:

- Deal 3: Client fixed deal on IBD Deal portfolio will be funded from ASU / FSU funding portfolio @ profile floating rate. Profile floating rate is rate derived from the currency of the client trade (JIBOR for ZAR, LIBOR for other currencies) and the profile – cashflow frequency - of the client deal. For example, if the client deal is in ZAR with monthly interest payments, then profile floating rate will be JIB01, for semi-annual interest payment JIB06, etc.
- Deal 2: Interest risk on IBD deal portfolio resulting from the difference between client reference rate (fixed rate) and funding rate (profile floating rate) will be hedged by IRS against ASU / FSU hedging portfolio.
- Deal 4 & 5: ASU / FSU funding portfolio will be funded from GTSY FND / FCU portfolio @ bank's funding rate (JIBOR 03 for ZAR, LIBOR 03 for USD / foreign currency).
- Deal 6: FRM will manually hedge interest reset risk resulting from difference between client reference rate and bank's funding rate on the ASU / FSU funding portfolio with IRS against ASU / FSU IR hedging portfolio.
- Deal X: Interest risk on ASU / FSU Hedging portfolio will be managed at aggregate basis by FRM by manually executing interest swaps with GM market portfolio.

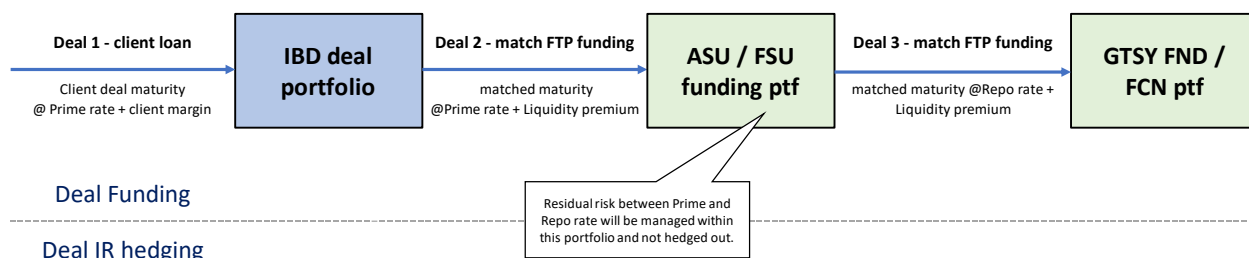


Murex automation requirements:

- Murex should automate generation of deals 2 – 5. These will be triggered by capture of the client deal in the IBD Deal portfolio in Murex.
- In the case of client deal break (e.g. early termination / prepayment), Murex will not modify any of the automatically generated deals (deals 2 – 5). These deals will be modified manually by FRM.

8.1.3 Prime rate loan

The following diagram outlines target funding process for prime rate loan:



Key points:

- Deal 2: Client deal on IBD Deal portfolio will be funded from ASU / FSU funding portfolio @ prime rate which will transfer fully interest risk to ASU / FSU funding portfolio.
- Deal 3: ASU / FSU funding portfolio will be funded from GTSY FND / FCU portfolio @ bank's funding rate (JIBOR 03 for ZAR, LIBOR 03 for USD / foreign currency). For prime loans, there will be no IBD benefit (33 bps) accumulated and paid over to IBD.
- FRM will not hedge interest reset risk resulting from difference between the prime rate and the bank's funding rate on the ASU / FSU funding portfolio – the risk will remain contained in the ASU / FSU funding portfolio.

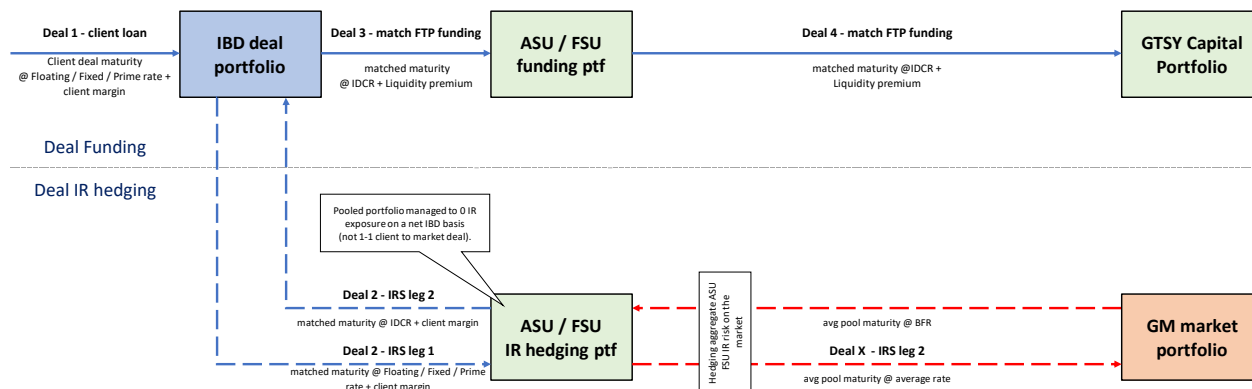
Murex automation requirements:

- Murex should automate generation of deals 2 & 3. These will be triggered by capture of the client deal in the IBD Deal portfolio in Murex.
- In the case of client deal break (e.g. early termination / prepayment), deal 2 should be updated automatically by Murex, while deal 3 should remain unchanged. These deals will be modified manually by FRM.



8.1.4 Preference shares

The following diagram outlines target funding process for preference shares (all rates – floating rate, fixed rate & prime rate):



Key points:

- Deal 3: Client fixed deal on IBD Deal portfolio will be funded from ASU / FSU funding portfolio @ IDCR rate.
- Deal 2: Interest risk on IBD deal portfolio resulting from the difference between client reference rate (fixed / floating / prime rate) and funding rate (IDCR rate) will be hedged by IRS against ASU / FSU hedging portfolio.
- Deal 4: ASU / FSU funding portfolio will be funded from GTSY FND / FCU portfolio @ IDCR rate.
- Deal X: Interest risk on ASU / FSU Hedging portfolio will be managed at aggregate basis by FRM by manually executing interest swaps with GM market portfolio.

Murex automation requirements:

- Murex should automate generation of deals 2 – 4. These will be triggered by capture of the client deal in the IBD Deal portfolio in Murex.
- In the case of client deal break (e.g. early termination / prepayment), Murex will not modify any of the automatically generated deals (deals 2 – 5). These deals will be modified manually by FRM.

8.1.5 Behavioural match funding

To optimize funding and capitalize on the frequent breaks / prepayments of the client deals, IBD requires implementation of the 'behavioural match' funding process for some of the deals (potentially majority of IBD book). This process is different from the match maturity funding as well as behavioural position funding processes described earlier in this document:

- Match maturity funding: funds individual trades on 1-1 basis, matching the cash profile of the original instrument (e.g. loan or bond) @ FTP rate corresponding to the contractual maturity of the original trade.
- Behavioural position funding: funds open positions overnight @ FTP rate corresponding to the behavioural maturity pre-set for given instrument position in the system. In this case the funding transaction does not match the cash profile of the originating position (e.g. bond).



Behavioural match funding is essentially match maturity funding as the process funds individual trades on 1-1 basis and matches the cash profile of the original instrument. However, it differs from the 'vanilla' match maturity process in the way it FTP prices funding transaction throughout its lifecycle:

- 'Vanilla' match maturity process prices the funding transaction with one FTP rate corresponding to its contractual maturity and applies this rate to the transaction from its inception through to its maturity.
- In behavioural match maturity process the funding transaction will be priced with two different FTP rates, each applicable to a specific stage of the funding transaction's lifecycle:
 - First FTP rate - the lower one - will be applied to the first stage of the funding transaction from its inception till the probable prepayment date estimated based on client & market behaviour.
 - Second FTP rate – the higher one – will be applied past the expected behavioural prepayment date until the maturity of the instrument.
 - The average of the two FTP rates will equal to the 'vanilla' single FTP rate applied to the funding transaction from its inception to its maturity (i.e. the same rate as used by the 'vanilla' match maturity funding process).

Business rationale for the behavioural match maturity funding is to facilitate cost-effective shorter-term funding on deals with high probability being prepaid early by clients, while ensuring that the total liquidity premium on a deal should client not prepay remains the same as if funded using 'vanilla' match maturity method.

The following illustrates possible solution for automation of this requirement in Murex (other solutions that may come up during design phase will be considered):

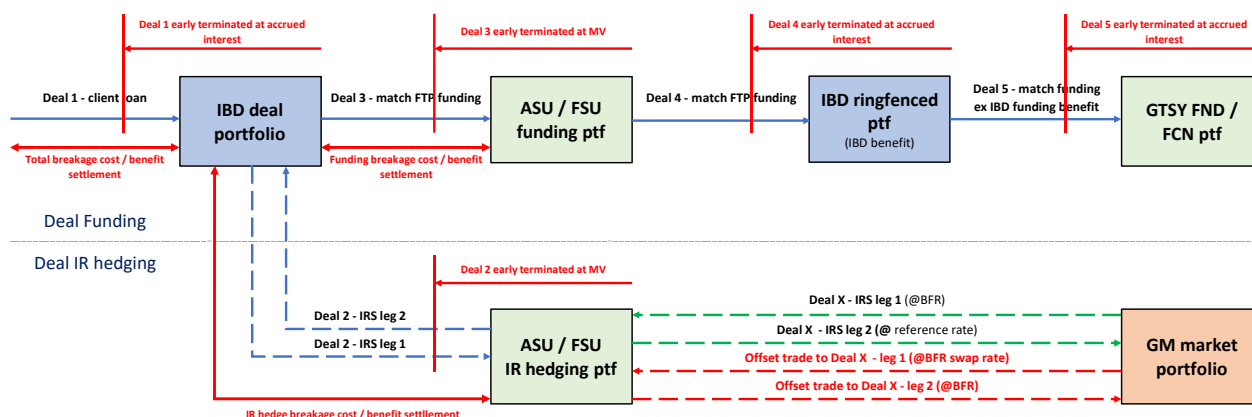
- Client deal captured / transferred to Murex will include information driving the behavioural match funding process, including flag whether the deal should be behaviourally funded, expected date of client prepayment (i.e. maturity of 'stage 1'), liquidity premium for stage 1 and liquidity premium for stage 2.
- Upon capture of the client deal in Murex, system will automatically generate funding transactions per processes outlined in the prior sections (floating rate loan, fixed rate loan, prime rate loan, preference shares). Should the client transaction be flagged for behavioural funding, the system will generate the funding transactions between IBD Deal portfolio, through ASU / FSU funding, IBD Ringfenced and GTSY FND / FCN portfolios (the ones depicted as solid blue lines in the diagrams above) as follows: Instead of capturing one funding transaction between each pair of portfolios, the system will generate two funding transactions:
 - Spot funding transaction with maturity equal to the expected date of client prepayment and cashflow profile matching that of the client deal up to that date. This transaction will be priced with liquidity premium for stage 1 received on the client deal.
 - Forward funding transaction with start date equal to the expected date of client prepayment and maturity equal to the client deal maturity. This transaction will be priced with liquidity premium for stage 2.
 - Each of these funding transactions will be valued using their respective liquidity premium as valuation spread.

Open question: Are there always going to be only two stages of behavioural funding with two LPs or is it possible that IBD may consider funding even more granularly?



8.2 Generic deal break process

The following diagram outlines in red generic processing of client deal breakage. The example used is early termination of the client loan – i.e. client prepays the loan in full before its contractual maturity:



Client deal breakage will be processed as follows:

1. Client deal (Deal 1) gets early terminated in IBD deal portfolio @ accrued interest
2. All client deal's match funding legs get early terminated as follows:
 - 2.1. Deal 3 is early terminated in IBD deal portfolio and in ASU / FSU funding portfolio @ market value
 - 2.2. Deal 4 is early terminated in ASU / FSU funding portfolio & in IBD ringfenced portfolio @ accrued interest.
 - 2.3. Deal 5 is early terminated in IBD ringfenced portfolio & GTSY FND / FCN portfolio @ accrued interest.
3. Client deal's hedge (Deal 2) is early terminated in IBD deal portfolio & ASU / FSU IR hedging portfolio @ market value
4. The original market hedge (Deal X) gets unwound by FRM between ASU / FSU IR hedge portfolio and GM market portfolio by executing new IRS that offsets the outstanding cashflows of the original hedge at the current market price.
5. FRM calculates the funding breakage cost / benefit resulting from combination of breakage in-between BRF reset period and difference between original LP and LP at the time of breakage. This cost / benefit is then settled between ASU / FSU funding portfolio and IBD deal portfolio.
6. FRM calculates the IR hedge breakage cost / benefit resulting from difference between the swap rate of the original hedge and swap rate of the offsetting market IRS. This cost / benefit is then settled between ASU / FSU IR hedging portfolio and IBD deal portfolio.
7. Total breakage cost / benefit - i.e. sum of the funding breakage cost / benefit & IR hedge breakage cost / benefit, is settled with client from the IBD deal portfolio.

8.3 Valuation of IBD deals using valuation spread

The nature of IBD deals is such that the margin fixed at the beginning of the deal as the differential between the client rate on client deal and internal FTP rate on the funding leg trickles in over the lifecycle



of the deal. As the market fluctuations do not affect this margin, IBD prefers to value client deals and their corresponding funding transactions throughout their lifecycle using the fixed spread over reference curve for discounting.

Hence IBD requires to value deals in IBD deal portfolio as follows:

- Client deals to be valued using reference rate curve plus fixed client margin (valuation spread)
- Match funding transaction will be valued using reference rate curve plus constant liquidity premium fixed at the origination of the deal.
- IRS hedge between IBD Deal portfolio and ASU / FSU Hedging portfolio will be valued using reference rate plus fixed client margin.