

# AgT-RMS : Quantitative Risk Management Solution



## AGNITYA Quantitative Solutions and Asset Management

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### Introduction

AgT-RMS is a front to back **IRRBB** software that provides the risk analysis of banking book, capital requirement of banking book and efficient hedging methodology for market risk and liquidity risk exposure. AgT-RMS offers state of the art curve construction methodology with new index, exposure calculation and consumer behaviour models based on advance computational techniques.

### Executive Summary

Overcoming the fallibility of pre-existing Risk Management Solutions, AgT-RMS renders-

- Cash flow modelling after the decommissioning of rate index;
- Modelling of balance sheet products with convexity adjustment due to currency switching, tenor switching and revolving loan facility;
- Cutting edge valuation models, which are customized to European products;
- Change in volume model and prepayment model with machine learning, which is sensitive to micro economical variables, local variables and human factors;
- Methodology of hedging the market risk (asset and liability gaps), liquidity risk and mapping of client behaviour risk to market risk.

### Functional Scope

- AgT-RMS ,
- provides, from NII and NPV prospective, integrated, standardized and uniform risk and financial view on bank’s balance sheet;
  - forecasts, from market analysis prospective, NII that can be used as the basis medium term planning, rolling forecast and scenario analysis;
  - provides, from risk prospective, the results that can be used as the basis for consistently computing risk matrix like NPV, NII at basis risk, vega risk and BPV in IRRBB reporting;
  - determines, from treasury prospective, the evolution of balance sheet (banking book) and corresponding risk matrix dynamics, volume models with advance machine learning algorithms;
  - connects with the different position keeping systems and market data systems.

### Product Scope

AgT-RMS develops cutting edge pricing algorithms for different kind of Interest rate and FX products. It is equipped with niche valuation models for off balance sheet products, such as fixed and variable consumer and corporate loans with revolving credit facility.

Products in scope	
Lending and Bank Accounts	Derivatives
Loans	Forwards
Deposits	Futures
Mortgages	Options
Current Accounts	Swaps
Overdrafts	Contract of Differences (CFD)
Saving Accounts	Interest Rate Options (Inc. Cap/Floor/Collar)
Nostro Accounts	Option on Futures
Loro Accounts	Swaptions
Bonds	Credit Default Swap
	Interest Rate Swap
	Interest Rate Currency Swap
	Forward Rate Agreement

### Methodology

#### Market Data Configuration

For market data configuration AgT-RMS offers-

- Curve construction methodology with new framework after decommissioning present index (for EUR, USD, CHF and GBP);
- Replication method for generating the bond yield curve for cash flow generation;
- Boot strapping of forward curve for different tenor by using the global optimization method to include the cross currency basis spread and forward basis spread;
- FTP curve with arbitrage free smoothing of forward curve.

#### Market Scenario

AgT-RMS generates the market scenarios in real and risk neutral measure.

- In risk neutral measure, it generates the underlying market rate scenarios with advanced method (Multi-curve stochastic local volatility labor market model) to-
  - i capture the dynamics of instantaneous correlation between forward rates;

- ii arrest the skew dynamic of the volatility surface (including the stochastic volatility surface);
  - iii obtain the inter asset correlation, which is calibrated to inter asset class products.
- For generating the scenarios in real measure, it adopts the advanced data filtering methods to ensure the generation of clean time series.
    - i For underlying spot process, it performs the data cleaning based on rejection methodology;
    - ii The volatility data surface is cleaned by density functional approach;
    - iii Liquidity of market data problem is solved with arbitrage free pricing approach;
- AgT-RMS also offers the special scheme to avoid the biased of the market scenarios.

### NPV Computation

- Single factor and multi factor Hull white models;
- Quasi Gaussian Models with low and high dimensions;
- Advanced loan pricer with convexity adjustment due to tenor switching, currency switching (European market);
- Advanced lower bound and upper bound models for calculating the optionality cost on loans and mortgages;
- Short rate models for change in value of the Deposits, with floating and fixed rate (European market).

#### For Derivatives (European market)

- Cash settled swaption pricer with TRS replication method (European market);
- Normal distributed Bachelier model for Caps;
- Cheyette model for the optionality cost based on multi-leg;
- LIBOR market model with multi curve frame work with inclusion of local volatility skew (European market);
- 2 factor Quasi Gaussian model for multi call optionality;
- Longstaff and Schwartz model for multi call;
- Mixed SABR model for the swaptions;
- High Yield bond valuation model with nth order convexity adjustment;
- Multi-factor valuation model for risk bond valuation;
- Valuation models for repos and municipal bonds.

### NII Computation

The sensitivity calculation for the large portfolio is a challenge. AgT-RMS develops the algorithmic differentiation method for fast calculation of risk sensitivities and NII computation in real time. The sensitivities of a portfolio of 3 Mio number of deals can done within 20 minutes (16GB RAM intel 7 processor).

### Behavioural Modelling

AgT-RMS offers the model for the Change of volume model which is sensitive to

- Client behaviour due to market movement (historical data of banks and insurance);
- Client behaviour due to local micro economical variables and non economical variables (INTEX data) including the underlying liquidity risk (in ABS, RMBS and CMBS) (from liquidity monitoring model);

AgT-RMS also offers the mapping of client behaviour risk to market risk in order to provide the hedge due to change in volume.

### NII Forecasting

AgT-RMS develops the NII forecasting based on real measure and risk neutral measure and uses stochastic dynamic optimization method for economic variables. The NII forecasting in risk neutral measure is suggested to achieve the best hedging results.

### Market Risk and Liquidity Risk Hedging

AgT-RMS offers the BPV matching method for Cash flow hedging. AgT-RMS generates the discounted cash flow at liquid pillar of the yield curve and offers the dynamic and static hedging suggestions for delta one and fixed income derivative products. The liquidity risk is minimized while optimizing the hedging portfolio.

### Reporting

AgT-RMS generates the reports in different formats such as pdf, csv, xls for

- PnL reconciliation
- Rolling forecast models
- Internal reporting