

CAPILEVER

SMARTLY **ACTIVATE** YOUR ASSETS

Interest
Rate
Comparison
Tool



Capilever is a **software company** that helps financial institutions prepare for the next wave of Open Banking with focus on Credits and Investments. Our team of technology and banking finance experts has joined forces to deliver world-class investment-and-lending software for the financial services industry.

Compare interest rate linked investment & credit products

Banks provide a variety of **interest rate linked credit and investment products**, with a range of interest rate conditions, reimbursement conditions and maturity periods. As a customer who is not a specialist in financial products, it is almost impossible to make a well-informed and quick decision towards the right product. Even if the customer has made himself an idea of how central bank interest rates will evolve in the future, it is still very difficult to **know and quantify the impact on the financial flows** happening during the total lifetime of the product.



At Capilever, we want to help customers **better manage their financial risks** and interest rate risk is a very important element in this. We believe that an intuitive and user-friendly way to compare different products, simulating certain evolutions in central bank interest rates, can help customers get a better feeling of their interest rate risks and **take a more informed decision for a product best fitting their needs** (investment horizon, risk appetite and vision on future evolutions of market interest rates).

The IRCT tool does not make any **comparison** on the quality (i.e. ability of underlying company to reimburse) of an investment product nor on the price of the product. It will merely simulate and compare the cash flows linked to reimbursements and/or coupon/interest payments. This means it also does not consider the options to pre-maturely call/put and/or convert to underlying securities.



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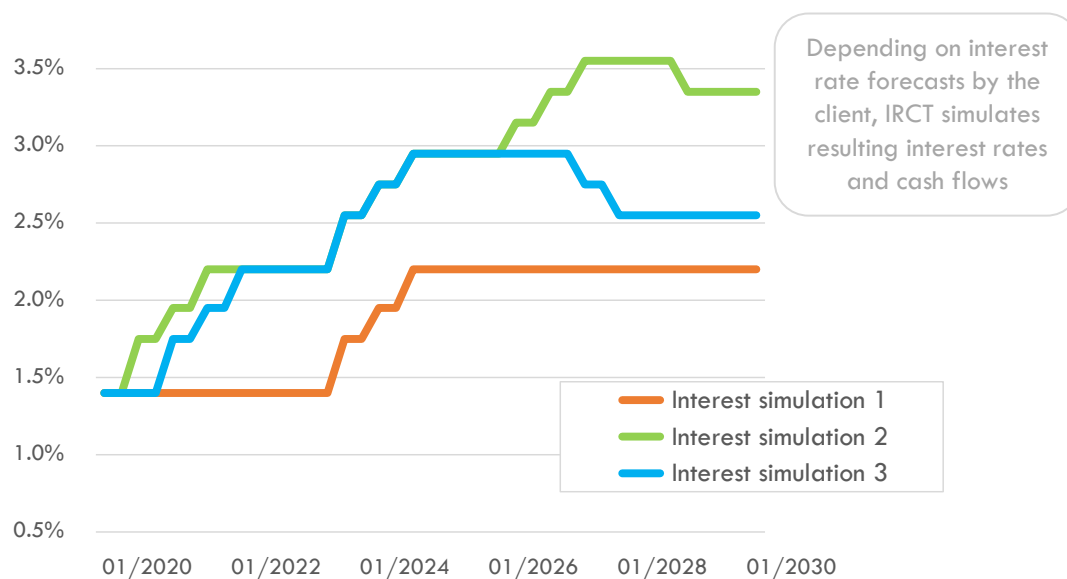
The IRCT tool considers following **criteria** for simulating and comparing different products:

- **Investment products:**
 - Maturity date
 - Interest rate conditions:
 - Fixed
 - Variable but with pre-defined rates (so a set of fixed values), e.g. step-up / step-down
 - Variable by linking to an underlying index/benchmark (with an offset)
 - No interest (discounted in price)
- **Loan products:**
 - Maturity date
 - Interest rate conditions:
 - Fixed
 - Variable by linking to an underlying index/benchmark (with an offset)
- With minimum and/or maximum cap
 - Reimbursement conditions:
 - Monthly reimbursements
 - Balloon
 - Bullet

The tool also allows to forecast inflation rates (adaptable by customer), allowing to discount all future cash flows to present value. their full credit and investment portfolio.

Note: Current loan origination tools allow simulating loan repayment plans taking into account loan amount, duration and interest rate conditions (fixed, variable). However, they usually do not allow the customer to forecast future interest rate evolutions and quantify their impact. Nor do these type simulation tools exist for most investment products. With IRCT the customer can anticipate and mitigate the positive/negative impact of certain interest rate linked scenarios on their full credit and investment portfolio.

IRCT interest simulations & forecasts



Capilever IRCT software solution

Capilever's IRCT software solution provides a **fully automated, end-to-end, white-labelled pre-packaged** solution to **compare different interest rate linked investment and credit products**.

- Step 1 (happening outside the tool): Customer selects the different loan/investment products he wants to compare. It is assumed that this is happening outside the IRCT tool and that the online banking platform then calls the IRCT solution with all relevant info on the selected products, including URL to request the product. This URL redirects the IRCT tool to the screen of Step 2. Note that products do not necessarily need to have the same maturity date.
- Step 2: Customer inputs all parameters required to perform the simulation:
 - Amount to invest/borrow
 - Three questions to be answered with yes/no:
 - When selected products have different maturity periods, IRCT tool asks if customer wants to compare with automatic roll-over
 - When one of the selected products, is an investment product with distribution of interests, IRCT tool asks if distributed interest should be re-invested
 - Ask whether customer wants to apply discounting of future cash flows to present value using forecasted inflation rates
- Step 3: Input of the expected evolution of central bank interest rates
 - This step is skipped, if:
 - All selected products have interest rates that are pre-defined (i.e. not depending on central bank interest rates)
 - All selected products have the same maturity date or customer answered "No" to the first question above (i.e. no automatic roll-over)
 - None of the selected products has distribution of interest or customer answered "No" to the 2nd question above (i.e. no automatic re-investment of distributed interest) (i.e.
 - The screen will show a graph of interest rates with
 - Example evolution of central bank interest over the last 20 years:



- X-axis: from current date till maturity date of products with maximum maturity date
- Y-axis: the interest rate
- On the graph the current central bank interest rate is filled in
- By default, the graph will be filled with current central bank interest rate for all future years
- Customer has the ability to select a few default pre-fillings:
 - o Current central bank interest rate fixed over full period
 - o Evolution from current central bank interest rate to double that rate at the end of the graph
 - o Evolution from current central bank interest rate to 0% at the end of the graph
- The graph indicates the relevant interest rate points to be determined by the customer. These points are determined by:
 - o Date-points at which interest rate is redefined based on central bank interest rate. For example when comparing three different 20 year mortgage credits, i.e. a fixed one, a 3-3-3 formula and a 5-5-5 formula, there is a date-point at 3, 5, 6, 9, 10 and 15, for which interest rates should be set
 - o When comparing investment products:
 - Date-point of maturity of shorter maturing products when customer has requested to roll-over
 - Date-point of interest rate payments on distribution product, when customer has requested to reinvest

- o The customer can move these relevant points up and down (via drag & drop) to define the interest rate he expects
- o Customer can save simulations with specific inputs for future comparison with other products
- o Customer can load a specific past input of interest rates. If the new comparison has other date-points to set, then:
 - When the missing date-point is in between two saved date-points, the default rate is calculated via interpolation. The customer can still overwrite if needed.
 - When the missing date-point is after the last stored date-point, the default rate is set equal to rate of last stored date-point. Again the customer can overwrite this rate for simulation purposes.

- Step 4: Definition of inflation rates
 - This step is optional and only applicable when customer has requested to discount future cash flows
 - This screen is similar to the screen for setting the interest rates (Step 3), i.e.
 - Example evolution of inflation rate over the last 20 years:



- X-axis: from current date till maturity date of products with maximum maturity date
- Y-axis: the inflation rate
- On the graph the current inflation rate is filled in
- By default, the graph will be filled with current inflation rate for all future years
- Customer has the ability to select a few default pre-fillings:
 - o Current inflation rate fixed over full period
 - o Evolution from current inflation rate to double that rate at the end of the graph
 - o Evolution from current inflation rate to 0% at the end of the graph
- The graph indicates the relevant inflation rate points to be determined by the customer. These points are determined by:
 - o Any date at which
 - For a credit product a reimbursement is done
 - For an investment product an (distributed) interest payment or reimbursement is done
 - o The customer can move these relevant points up and down (via drag & drop) to define the inflation rate he expects.
 - o Customer can save a specific input for future comparison (with other products)
 - o Customer can load a specific past input of inflation rates. If the new comparison has other date-points to set, then:
 - When the missing date-point is in between two saved date-points, the default rate is calculated via interpolation. The customer can still overwrite.
 - When the missing date-point is after the last stored date-point, the default rate is set equal to rate of last stored date-point. The customer can still overwrite.

- Step 5: The IRCT tool shows a comparison of selected products:
 - When **comparing investment products**, the tool shows for each product :
 - Total resulting amount
 - Total interest amount
 - Overview of all interest & reimbursement flows
 - When the product has a shorter maturity date than the maximum maturity date of the selected products and the customer has selected to roll-over at maturity date, the IRCT tool also shows in a comparison table:
 - o Total resulting amount at maximum maturity date
 - o Total interest amount at maximum maturity date
 - o Overview of all interest & reimbursement flows (including after roll-over)
 - When customer has requested to discount future flows, each of the above (applicable) amounts in the comparison table will also be discounted to present value and added next to the amount.
- When **comparing credit products**, the tool shows a comparison table with for each product
 - Total repaid amount
 - Total interest amount
 - Overview of all reimbursement flows (repayment schedule)
- When customer has requested to discount future repayment flows, each of the above amounts in the comparison table will also be discounted to present value and added next to the amount.
- The IRCT tool also highlights in color the cheapest product and most expensive product and visually compares the different products in user-friendly graphs. When the customer does not want to consider inflation, the comparison is based on total amount of interests to be paid. When the customer also wants to include inflation, then comparison between the different products is done based on the total amount of interests discounted to present value with the forecasted inflation rate
- The tool allows to generate and store a PDF with an overview of all comparison results
- The tool also shows a button to request each compared product, based on the URL passed in the API call in Step 1. When user clicks on this button, the corresponding product can be automatically requested, which happens outside the IRCT tool and typically within the loan origination or investment system of the bank



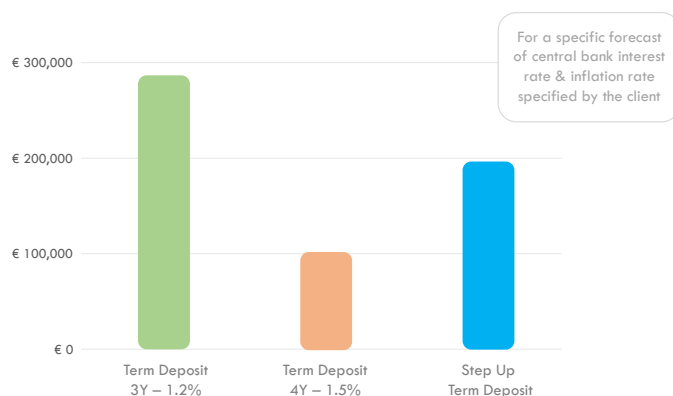
Example visualization:

Investment comparison

- Comparison of 3 investment products
- Customer has requested to reinvest money
- Customer has requested to discount cash flows (discounted values are between brackets)

	Term Deposit 3Y 1.2%	Term Deposit 4Y 1.5%	Step Up Term Deposit
Total resulting amount	€ 10.233,45 (€ 10.166,22)	€ 10.303,22 (€ 10.102,22)	€ 10.355,66 (€ 10.145,02)
Total interest amount	€ 233,45 (€ 166,22)	€ 303,22 (€ 102,22)	€ 355,66 (€ 145,02)
Total resulting amount at max. maturity date	€ 10.533,45 (€ 10.288,45)	€ 10.303,22 (€ 10.102,22)	€ 10.378,45 (€ 10.195,02)
Total interest amount at max. maturity date	€ 533,45 (€ 288,45)	€ 303,22 (€ 102,22)	€ 378,45 (€ 195,02)
Flows	See cash flows	See cash flows	See cash flows

Compare Term Deposits : Total Discounted Interest Amount

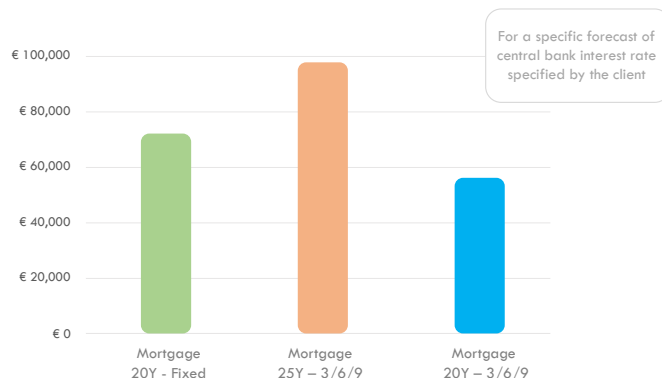


Credit comparison

- Comparison of 3 credit products
- Customer has not requested to discount cash flows

	Mortgage 20Y - Fixed	Mortgage 25Y - 3/6/9	Mortgage 20Y - 3/6/9
Total repaid amount	€ 372.233,45	€ 398.333,45	€ 356.456,56
Total interest amount	€ 72.233,45	€ 98.333,45	€ 56.456,56
Flows	See cash flows	See cash flows	See cash flows

Compare Loans : Total Interest Amount



Note: the tool can also be used by a bank employee. In that case the process remains entirely the same except that the bank employee inputs the conditions of the different scenarios (for example a credit agent in a branch using his tablet device)

Benefits

The IRCT product of Capilever provides an easy and intuitive way to compare investment and credit products, based on a given forecast of the central bank interest rates and (if requested by customer) inflation rate.

Customer benefits

- Take more conscious decision for an investment / credit, with regards to interest rate risk. This means choosing the product that best suits :
 - Customer strategy
 - Customer risk appetite
 - Customer vision on interest rate and (if requested) inflation rate evolution

Bank Benefits

- Improved customer service: better informing customers about the impact of choosing a specific product. Thanks to the IRCT tool the customer can easily compare the impact of changing interest (and inflation) rates on the expected revenues (when investing) or costs (when lending) for the different products offered by the bank
- Assist bank employees in better providing advice to customers. For example when comparing a mortgage of 20 years with fixed interest rate, compared to a 3/6/9 variable interest rate formula, with a cap of maximum 2%
- Banks can provide more innovative interest-linked investment/credit products, as tool can explain easily how the product will evolve when interest rates fluctuate



Solution overview

The IRCT software package is a **packaged software solution**, which can be **easily configured** via parameters and **customized** via software extensions.

The package is delivered by Capilever, deployed on-premise at the bank (or on a cloud account of the bank) and configured/customized either by Capilever consultants or by the bank itself. Capilever will deliver regular version upgrades, which can be deployed by the bank and for which backwards compatibility of the configurations/customizations is guaranteed.

The software solution consists of 4 parts:

- **Front-end layer:**
 - A white-labelled responsive web front-end, developed in React, which allows to perform all above described functionalities
 - 3 flavors of this web front-end exist:
 - Customer user
 - Bank employee user
 - Administrator
 - Basic style-sheet customizations are possible for these screens, but when bank wants to fully integrate and design in the house-style it is recommended to build their own front-end. As front-end layer is decoupled from application layer, via well-documented REST-based APIs, these APIs can also be used by the new custom-built front-end
- **Application layer:**
 - Contains all logic described in this document and provides necessary APIs to the front-end layer to deliver the full application logic
 - This layer is built up of 2 modules:
 - Workflow module: module managing the process and screen flow, i.e. determining which step and which information to be shown to the customer at a certain moment
 - Calculation module: module to calculate all simulations, comparisons and resulting graphs based on the provided information
- **Database layer:**
 - A standard SQL database with a pre-defined, yet customizable data model
 - A meta-dictionary allows easy configurability and automatic documentation of the IRCT data model
- **Integration layer:**
 - The IRCT tool will need to be integrated in order to operate correctly. Some of the required integrations are:
 - API to receive product information of products to be compared
 - API to retrieve current central bank interest rate and/or current inflation rate
 - API to retrieve the results of a simulation done in the IRCT tool
 - 2 types of APIs:
 - APIs exposed by the IRCT tool:
 - o Well-documented REST-based APIs to retrieve information from the IRCT tool. For example in order to retrieve results of a simulation to be used in the Daily Banking app
 - APIs called by the IRCT tool:
 - o The application layer is foreseen to call several pre-defined REST-based APIs (e.g. for (re)valuation of certain investment assets), which of course will not match with the bank's services
 - o The integration layer will transform those standard IRCT APIs to the proprietary APIs of the bank
 - The integration layer will also foresee several mocks (against the pre-defined internal REST-based APIs) in order to setup and test the application without integrating with the bank systems

Example use case

Emily and Peter want to buy a house and need to take a mortgage loan. After careful comparison between different banks, they found that their own bank gives the best interest rates and service. After a visit to their branch, the bank employee has made several offers for Emily and Peter, i.e.

- A fixed-rate offer for 30 years at 2,1%
- A fixed-rate offer for 20 years at 1,7%
- A variable-rate (formula 1/1/1) offer for 20 years at 1,5% (with cap of +2%)
- A variable rate (formula 3/6/9) offer for 20 years at 1,6% (with cap of +2%)

Emily and Peter now need to decide which formula fits best with their budget and future expectations and risk profile. Luckily their bank offers the IRCT tool of Capilever. When they logon to their online banking the 4 products offered by the bank are automatically available. Emily and Peter select the 4 products for comparison and enter a first situation of a bank interest rate (e.g. Euribor) staying flat at 1,2% for 30 years. The tool automatically shows how the 4 formulas react to this situation and what are the resulting reimbursement tables.

Afterwards, Emily and Peter look at a few other scenarios, e.g. scenario where interest rate doubles after 1 year and triples after 3 years. And a scenario where interest rate gradually increases with tiny bits and then drops again after 10 years.

Based on all these comparisons Emily and Peter decide to go for the variable rate (formula 1/1/1) as it best suits their expectations of future interest rate evolutions.



About us

Capilever is a software company that helps financial institutions prepare for the next wave of **Open Banking** with focus on **Credits** and **Investments**.

Our team of technology and banking finance experts has joined forces to deliver world-class **investment-and-lending white-labelled software solutions** for the financial services industry.

All products in Capilever's product offering are software solution sold to banks to assist their customers in **better managing their financial risks** (from liquidity risk management, market and interest rate risk, up to counterparty risk).

All products come with several **well-defined APIs**, which can be easily integrated within the bank, with strong focus on orchestration and **automation** of underlying **credit and securities processes**.

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CLEVER API