ICRFS-Plus™ relational databases

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1. Introduction: a small footprint belies analytical power

Don’t be fooled by the small footprint and ease of installation of ICRFS-PLUS™!

Some people have the idea that a big corporation needs to use big and difficult software to warehouse and analyse all its data. They think that the longer it takes to install and the more headaches it produces the more they are getting their money’s worth.

**ICRFS-PLUS™ proves that this is not the case.**

A company may have to keep track of thousands of separate divisions with data being imported and updated in next to real time.

How long do you expect it to take to have a fully featured system which can answer to the needs of the entire actuarial and management teams up and running? Months? Weeks?

**How about a few days?**

After importing the data you shouldn’t need to think about the software, you can concentrate on using it on your data to get the best and most actionable information out of it!

Implementation

A typical industry implementation time frame for making data available for actuarial analysis purposes can run to many months.

In contrast, Insureware provides database scripts allowing enterprise wide, server databases to be set up **within hours**, including read-only repositories.

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**Typical ICRFS-PLUS™ implementation time frame:**

Set up database(s) → Import data → Validate importing → Use analytic tools

Import data → Validate importing → Use ICRFS-PLUS™ analytic tools

Set up server database(s)

Actuarial teams can access their data and include the powerful analytical modelling tools of ICRFS-PLUS™ within the company’s workflow within days.
Significant gains to an Insurance organisation can be achieved by creating one or more corporate ICRFS-PLUS™ databases. The database, stored on a central server, serves as a repository for all aspects of the company’s long tail liability risks including:

- Models.
- Reserve, future underwriting, and combined forecast scenarios.
- Calendar year paid loss distributions and correlations.
- Distribution of aggregate reserves.
- One-year look-ahead statistics including variation in mean ultimates.
- Risk capital allocation by LOB and calendar year.
- Value-at-Risk and Tail-Value-at-Risk by Calendar Year, Accident Year, and Total for multiple LOBs.
- Solvency II one-year risk horizon metrics, IFRS 4 metrics, and ultimate year risk horizon metrics.

A read only option can be invoked to create a corporate database as an archive or to share information within the company. The ability to update such a database is limited to privileged users.
3. Workstation or localised **ICRFS-PLUS™** databases

Individual segments of the business (triangle groups) can be extracted from the corporate database to smaller, specific databases shared within an actuarial team. The corporate database is updated when work is completed.

ICRFS-PLUS™ users can work collaboratively from different locations in all aspects of modelling, forecasting and reporting. This flexibility supports incorporating ICRFS-PLUS™ into a company’s preferred work flow tree without compromise.
4. Database security and enterprise wide schemas

- Data within ICRFS-PLUS™ relational databases are stored in a proprietary format; data only readable within ICRFS-PLUS™.
- ICRFS-PLUS™ requires user authentication for all server databases: ORACLE, SQL Server, and Interbase databases.
- Database administrators can manage user access privileges for each SQL Server and ORACLE ICRFS-PLUS™ databases. Users can have full privileges or restricted (read-only) access.
- Companies can use multiple ICRFS-PLUS™ databases according to the company’s workflow.
- Scripts to create ORACLE, SQL Server, Interbase ICRFS-PLUS™ databases are supplied. Databases can be created in a few minutes.

Example ICRFS-PLUS™ data management scheme

- Server databases (blue databases) are implemented by region (department) and corporately.
- Actuarial users (orange screens) have full access (solid lines) to the respective server databases within their department (region) to their own local workstation. They have read-only privileges (dashed line) for the corporate server database.
- DBAs (blue screens) have full access to all ICRFS-PLUS™ server databases.

This set up is very flexible and is one of many configurations that are possible based on the needs of the corporation or actuarial departments. For instance, regional server databases may act as a repository for the region and also would be read only for regular users. The actuaries under this configuration would perform all modelling revisions on their local databases and only privileged users would propagate the final revisions to the regional server database repository.
5. Seamless communication between ICRFS-PLUS™ databases

- Drag and drop triangle groups (datasets, models, forecast scenarios, and other objects) between two ICRFS-PLUS™ databases.

1) Open local database
2) Open transfer database
3) Select triangle groups to copy
4) Drop selection on local database window

- Transfer your work from a corporate database on a server to a local database when you are going to be away from your network - or back to the server when you return (below).
6. Import and update large volumes of data

Triangle data in Excel or unit record transactional data in Microsoft Access (or other databases) can be imported directly into an ICRFS-PLUS™ database via the ICRFS-PLUS™ COM API. With unit record data, queries can be created to produce any combination of triangles the actuary requires.

Scripts facilitate updating data (including models and forecasts) automatically – including simple checks on changes in forecasts distributions to provide alerts on potential problems.
7. Multiple currencies

- Currency preferences enable quick selection of most commonly used currencies and associated symbols.

- Multiple currencies can be managed within a single database pertaining to multiple regions.
  - Triangle groups can be associated with a nominated currency (right click menu: inset).
  - Composite triangle groups can link to triangle groups of varying currencies.

- Model data in original currencies.

- Obtain summaries:
  - In each individual currency.
  - By converting to a single currency using applicable exchange rates in the MPTF forecast scenario.
ICRFS-Plus™ relational databases

8. Organise data according to your requirements

Accessing data and information through the ICRFS-Plus™ system is a pleasure. All the information in the database including data, models, and results, are right at your fingertips.

Data, Models, and Reports

Composite triangle groups collate data from multiple triangle groups and form the base for a single composite model for the whole company.

Triangle groups contain:
- Triangles;
- Premiums;
- Exposures;
- Inflation;
- Datasets;
- Models;
- Forecast scenarios; and
- Links to reports.

All this in a structured, relational database.

Models, forecasts, and data relevant to a Line of Business (LOB) or segment (including notes) are associated via triangle groups providing ready access to data and results.

Flexible structure

Use the system defined types or create any other additional triangle types which best describe your company’s triangle data.

A large number (32) of user-defined classification variables can be used. An unlimited number of values can be associated with each variable providing maximum flexibility. In addition, there are four system defined categories: Type of TG, Valuation Date, Sampling Period, and Currency.
Triangle Groups contain building blocks:
- Triangles.
- Exposure, Inflation, Premium vectors.
- Datasets which link triangles with [optional] exposure, inflation or premium vectors.
- Composite datasets which contain at least one link to a dataset.

Composite triangle groups link with ordinary triangle groups. These contain:
- Composite datasets assembled from datasets from any connected triangle group.
- Composite datasets and datasets supply data to all modelling frameworks.

All data and modelling objects have user-customisable descriptions associated with them.
9. Database navigation

All triangle groups and content within triangle groups can be accessed within a few mouse clicks. There is no need to run complicated queries to find and access data. Finding data is a quick and easy exercise.

Know the name of the triangle group you need? Simply begin typing the name in the triangle group window and the triangle group will be displayed.

Two main views are presented to enable quick access of information: tree view and query view. These two views are structurally similar, but activate different combinations of exploratory filters in the database.

Tree view

Triangle groups are filtered in tree view sequentially – from one category in the variable list to other categories as required. Access is sequential from one level to the next in the hierarchy.

Common queries in this format may be:

- Display all triangle groups corresponding to company: 21st Century Pacific Ins Co;
- Display all Worker’s Compensation Lines of Business;
- Show data for Mutual companies writing Worker’s Compensation in domicile of California.

All of these queries retain a single value for each variable in the hierarchy. The depth of the tree is only limited by the number of variables (triangle group classifiers) in the database.

Example

Navigation through the view is simple with categories displayed via clicking on the [+ ] entries (1). Sub-filters are displayed by right clicking and selecting from the list of other available variables (2).
Query view

Triangle groups are filtered in query view simultaneously across categories. In addition, wild-card filters are permitted providing substantial flexibility in creating queries to quickly find your data.

Common queries in this format may be:
- Select companies with loss ratios between various levels;
- from Line of Business: PPA;
- with aggregation code 3;
- and that have been modelled.

Any or all of these queries can correspond to a single value, multiple values, or search strings.

Example

Above a filter has been created for all companies with:
- name contains ‘insur’;
- loss ratios (LR): 75 < LR <= 85;
- Aggregation code: 3; and
- Modelled: Yes.

Note Modelled is a user-defined variable added to the ICRFS-PLUS™ (converted from A.M. Best Schedule P) database.
10. Updating, collapsing and truncating triangle groups

Update (Expand)

- New triangle groups can be created (original data left untouched) or updating can be done in place.
- All probabilistic models are retained as part of the updating algorithm.
- Monitoring is effortless as all models and scenarios from the previous update period are automatically extended for the new data diagonals.

Collapse basic triangle groups

- Basic triangle groups can be collapsed from higher resolution sampling periods (e.g., quarter) to lower resolution sampling periods (e.g., year) or mixed sampling periods (as here, year versus quarter).

Truncate

- Truncation of triangle groups by development period is available. Cumulation can be applied by accident or calendar periods.
11. Run calculations across triangle groups

Combine basic triangle groups

- Multiple basic triangle groups of the same dimensions can be combined to facilitate calculations across triangle groups.

Run modelling wizard

- Run the modelling wizard for the selected basic triangle groups for any combination of triangle types.

- All manipulation of triangle group data, whether across triangle groups or within triangle groups, can be automated with COM scripts.
Basic triangle groups

• Although typically completed via COM routines or importing from XML, the ICRFS-PLUS™ system also allows creation of triangle groups manually.

• Combinations of sampling periods, currencies, and truncation is available to match the triangle shapes used by individual companies. The maximum triangle group size is 300 periods.

Create composite triangle groups

• Assign triangle group classification values as part of creation of the composite triangle group.
13. Work with triangle groups of arbitrary shapes

- Mixed sampling periods: year vs quarter, half-year vs month, and more!

- Truncated by accident period (if in run-off).

- Create triangles where the number of calendar periods is less than the number of accident periods.
14. Inside triangle groups

Triangle groups connect all the data relating to a Line of Business, portfolio, or segment into a cohesive unit. The data can then be utilised in the modelling frameworks. All data are related clearly within the triangle group in an orderly fashion.

Basic triangle groups

- Models, forecast scenarios, and notes are associated with data.
- All results for modelling and forecasts can be quickly found, answers replicated, and reports generated.
- Descriptions can be associated with any object providing brief value snippets to remind the user of important points about the data, model, or forecast scenario.
Composite triangle groups

Aside from composite datasets and notes, all objects within a composite triangle group are sourced from the linked basic TGs.

- At least two basic triangle groups must be linked within a composite triangle group.
- Access to basic triangle group data is controlled by the linked datasets.
- Any updates to data in the basic triangle groups are automatically applied to the composite triangle groups.
- Updating and monitoring is transparent and immediate.

- Models, forecast scenarios, and notes and are associated with data.
- All results for modelling and forecasts can be quickly found, answers replicated, and reports generated.
- Descriptions can be associated with any object providing brief value snippets to remind the user of important points about the data, model, or forecast scenario.
Datasets

The datasets tab allows management of all data links relevant to modelling triangles including:

- Exposure, Inflation, Premium vectors.
- Related [Associated] triangles (e.g., Paid losses can be associated with Case Reserve Estimates or Incurred Losses).
- A description field for any pertinent notes regarding the composition of the dataset.
- Operations on datasets (such as transformation, arithmetic, or splitting) can also be conducted on this tab.

Composite datasets

- Composite datasets consist of a set of incremental or cumulative datasets.
- If the composite dataset resides in a composite triangle group, then datasets can come from any linked basic triangle group.
- If the composite dataset resides in a basic triangle group, then datasets included in the composite are sourced from the triangle group.
- Once models are created, composition of composite datasets is fixed.
- All pertinent dataset attributes are visible and any column can be used for sorting.
Access information instantly

Models, forecast scenarios, etc

- All data for reproducing results stored within the relational database allowing any output table to be reproduced typically within a few mouse clicks.
- Models, forecasts, and other saved objects can be transferred within the Triangle Group (within datasets) or across multiple triangle groups or even databases.

Triangles

- Triangle data stored on the triangles tab.
- Many triangle types can be utilised within the same Triangle Group.
- Multiple datasets (previous) can be associated with the same triangle providing flexibility for evaluating and using exposures (or inflation) vectors.

Exposure/ Inflation/ Premiums

- Exposures, inflation, and premium vectors are all managed on the Exp/Inf/Prem tab.
- Multiple vectors can be stored simultaneously as exemplified above.
- Datasets are easily assembled.
- Each dataset is linked to one exposure, inflation, or premium vector.
15. Calculations within triangle groups

**Transform**

- If transforming a dataset with an associated inflation, then inflation adjusted data can be created in either cumulative or incremental form.

**Add, subtract, multiply or divide triangles**

- Mathematical operations can be applied to either triangles or datasets to create new data triangles.
- Above a triangle group has been combined so that calculations across LOBs can be performed.
Split datasets

- Datasets can be split by accident year enabling quick evaluation to see if trends are the same between sets of accident periods.
- Composite datasets, split exposures, and split premiums can all be created automatically.

Restore triangles

- Restore triangles using the relationship IL = CRE + PL. As long as any two triangles are available, the third can be restored.

Simulate triangles

Want to see how different modelling techniques work on data where all the parameters are known? Simply simulate the data using those parameters and see whether the models can replicate the known features.

- Full control over all parameters is provided: for the three directions and the process variance.
- Associate exposure, inflation, or premium data if required.
16. Harness the power of **ICRFS-PLUS™** to A.M. Best Schedule P data

The unique technological power of ICRFS-PLUS™ combined with A.M. Best’s Schedule P data will give your company a strategic edge.

Convert these data into an ICRFS-PLUS™ database to obtain all the data organisation, customisation, and modelling capabilities of ICRFS-PLUS™. Gain a competitive advantage by comparing your company’s intrinsic risk characteristics and loss costs with those of your competitors.
- Compare your company’s trends to trends in other companies and/or the Industry.
- Compare company’s risk portfolios.
- Calculate market share of liabilities; compare with premiums.
- Compare your reserve estimates with the company’s held reserves (CRE+IBNR).
- Quickly examine companies with similar loss ratio.
17. Wealth of analytical power in ICRFS-Plus™

All the ICRFS-Plus™ tables and graphic displays based on the identified (optimal) composite model, in the MPTF modelling framework for multiple LOBs (or segments), can be replicated in matter of seconds as a result of Insureware’s extremely fast computational algorithms. ‘What if’ analyses can be considered and results obtained very quickly.

One double click loads the identified model and reveals pictorially the volatility structure of each long tail LOB and their inter-relationships (correlation structures). Critical financial information including reserve distributions by accident year, calendar year and total for each LOB and the aggregate of all LOBs, reserve distribution correlations between LOBs, risk capital allocation by LOB and calendar year, T-V@Rs and V@Rs for different time horizons, and more can be computed within a few seconds. A company-wide report for long-tail liability lines can be created with a single report template.
Legend

1) Forecast distributions for each future cell, for each segment (or line of business) for any aggregation across segments.
2) Reserve forecast distribution correlations between LOBs by total, accident year, and calendar year.
3) Summary tables by accident year, including one-year ahead statistics (equivalently, variation in mean ultimates one-year hence).
4) Summaries by calendar year.
5) Risk capital allocation by calendar year and accident year.
6) Graphs of ultimates versus accident year and future liability stream versus calendar year.
7) Summaries by Line of Business; means and CVs.
8) Aggregate distributions by accident year (simulated from predicted correlated log-normals), calendar year, and total - including Value-at-Risk (V@Rs) and Tail-Value-at-Risk (TV@Rs) - for each segment and any aggregation.
9) Economic balance sheet that includes: Solvency II risk metrics, risk capital calculations and graphs.
10) Distributions for the aggregate, and each segment, for future underwriting (accident) years used for pricing.

ICRFS-PLUS™ contains Insureware’s PTF and MPTF modelling frameworks. Data, models, forecast scenarios, and links to reports all reside in a relational database. The database is a repository for all triangle groups (containing triangles, premiums, exposure measures, models and reports etc.) indexed by line of business, group member, territory and/or any other user-defined criteria.