

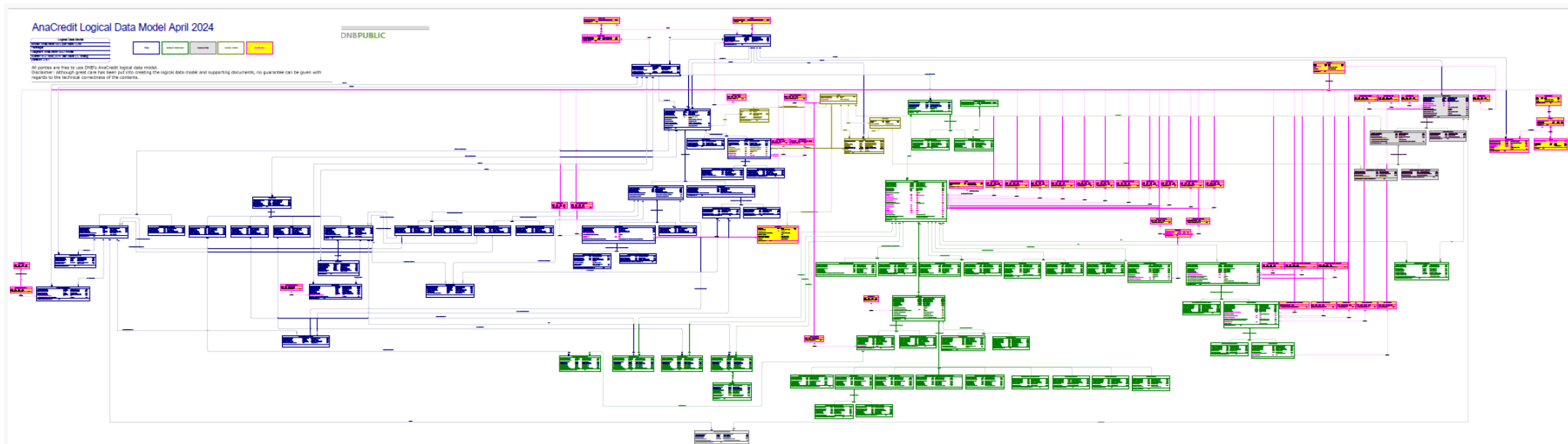


Validating granular XBRL-data

- Paul Hulst & Mark Goodhand
- De Nederlandsche Bank / CoreFiling

Reporting becomes granular

- Regulators need more data to perform their tasks. They move towards granular, broad data sets that allow many usages replacing narrower, topic specific forms.
- Granular datasets consists of tables, each containing multiple facts about an item (e.g. a loan). Many of these tables are related to other tables (e.g. a loan to a party receiving the loan).



DNB logical model for AnaCredit consists of 50+ entities. All entities are open tables having primary keys and mandatory "columns", most are related to other entities.

Reporting becomes granular and XBRL must keep up

Typical requirements for granular datasets are mandatory facts, unique keys and referential integrity.

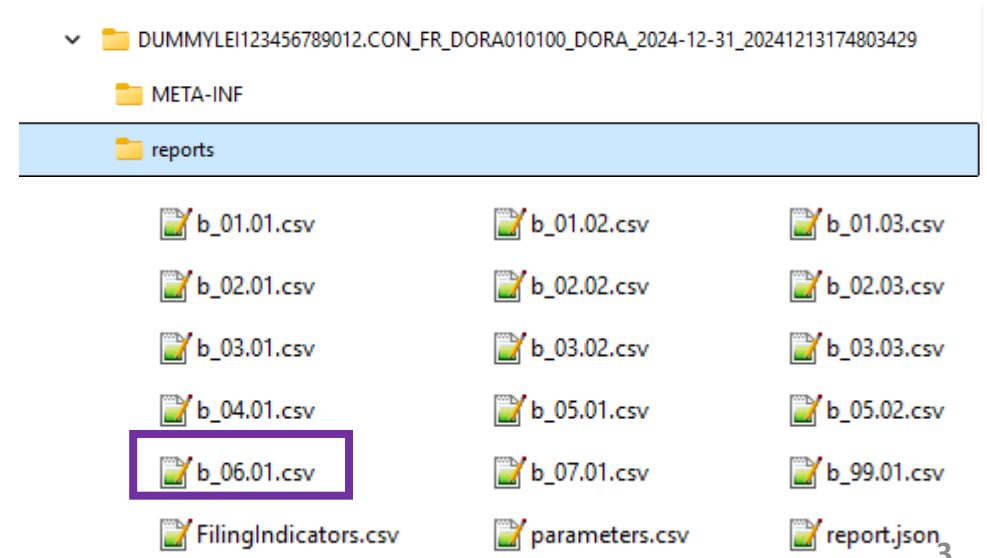
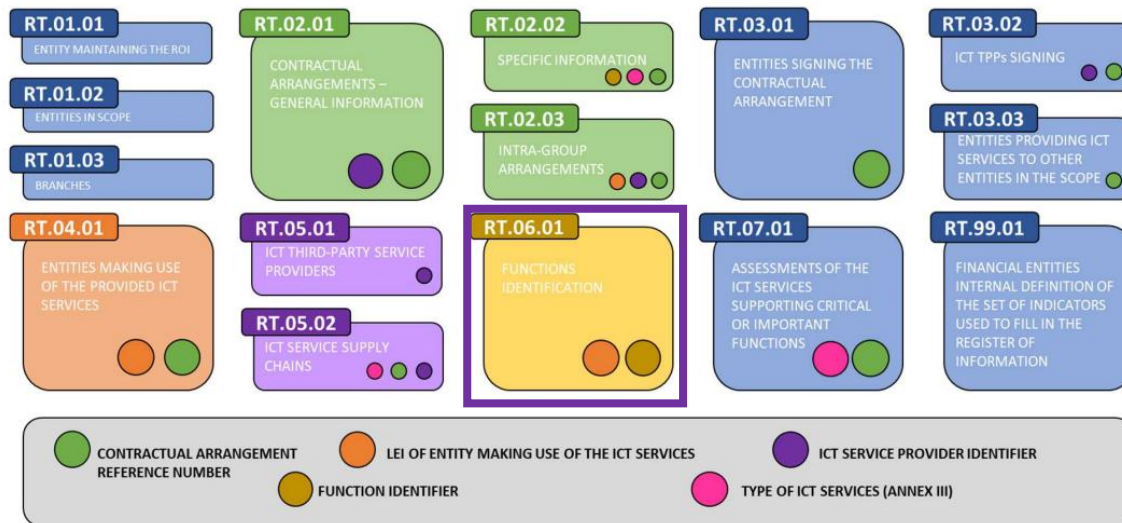
These kind of checks are nearly impossible to execute using XBRL Formula on large dataset.

Main reason: XBRL Formula works on finding individual facts in an unstructured collection.

Table Constraints builds on the grouping of facts in meaningful containers offered by xBRL-CSV.

Reading the data by “table” and “row-by-row” makes them “easy” to run.

Illustration 1: Structure of the Register of Information



TC Example – 1 – DORA B_06-01 “Functions”

| B_06.01 - Functions identification | | | | | | | | | | | |
|------------------------------------|----------------------|--|---------------------------------------|-----------------------------|---|--|--|---|--|--------------------------------------|--|
| Columns | | | | | | | | | | | |
| | Function Identifier | Licensed activity | Function name | LEI of the financial entity | Criticality or importance assessment | Reasons for criticality or importance | Date of the last assessment of criticality or importance | Recovery time objective of the function | Recovery point objective of the function | Impact of discontinuing the function | |
| | 0010 | 0020 | 0030 | 0040 | 0050 | 0060 | 0070 | 0080 | 0090 | 0100 | |
| Rows | Open Rows | 480217 <Identifier of the operational/business function of an entity> | 485465 [Type of licenced activity] | 487452 text | 480201 <Lei code of the entity making use> | 485467 [Function is critical or important?] | 485468 text | 485466 yyyy-mm-dd | 487474 # | 487475 # | 485464 [Impact of function discontinuing] |
| Unique key | B_06_01 | | | B_06_01 | | | | | | | |
| Mandatory column | | yes | yes | | yes | | yes | yes | yes | yes | |
| Column constraint - datatype | string | string | string | string | boolean | string | date | integer | integer | string | |
| Column constraint - value | minLength, maxLength | enumerationValues | minLength, maxLength | patterns | | enumerationValues | | minExclusive | minExclusive | enumerationValues | |

If a value exists for c0030, .. Then c0020 must exist as well.

C0040 must follow the LEI pattern.

| VR Code | Expression |
|----------|---|
| v23682_e | with {tB_06.01, default:null, interval:false}:not (isnull ({c0020, c0030, c0050, c0070, c0080, c0090, c0100})) |
| v8977_m | with {tB_06.01, default:null, interval:false}:if (not (isnull ({c0030})) or not (isnull ({c0050})) or not (isnull ({c0060})) or not (isnull ({c0070})) or not (isnull ({c0080})) or not (isnull ({c0090})) or not (isnull ({c0100}))) then (not (isnull ({c0020}))) endif |
| v8878_m | with {tB_06.01, default: null, interval: false}:if (not (isnull ({c0020}))) or not ((isnull ({c0050}))) or not ((isnull ({c0060}))) or not ((isnull ({c0070}))) or not ((isnull ({c0080}))) or not ((isnull ({c0090}))) or not ((isnull ({c0100}))) then ((not (isnull ({c0030})))) endif |
| v8879_m | with {tB_06.01, default: null, interval: false}:if (not (isnull ({c0030}))) or not ((isnull ({c0020}))) or not ((isnull ({c0060}))) or not ((isnull ({c0070}))) or not ((isnull ({c0080}))) or not ((isnull ({c0090}))) or not ((isnull ({c0100}))) then ((not (isnull ({c0050})))) endif |
| v8880_m | with {tB_06.01, default: null, interval: false}:if (not (isnull ({c0030}))) or not ((isnull ({c0050}))) or not ((isnull ({c0060}))) or not ((isnull ({c0020}))) or not ((isnull ({c0080}))) or not ((isnull ({c0090}))) or not ((isnull ({c0100}))) then ((not (isnull ({c0070})))) endif |
| v8881_m | with {tB_06.01, default: null, interval: false}:if (not (isnull ({c0030}))) or not ((isnull ({c0050}))) or not ((isnull ({c0060}))) or not ((isnull ({c0070}))) or not ((isnull ({c0020}))) or not ((isnull ({c0090}))) or not ((isnull ({c0100}))) then ((not (isnull ({c0080})))) endif |
| v8882_m | with {tB_06.01, default: null, interval: false}:if (not (isnull ({c0030}))) or not ((isnull ({c0050}))) or not ((isnull ({c0060}))) or not ((isnull ({c0070}))) or not ((isnull ({c0080}))) or not ((isnull ({c0020}))) or not ((isnull ({c0100}))) then ((not (isnull ({c0090})))) endif |
| v8883_m | with {tB_06.01, default: null, interval: false}:if (not (isnull ({c0030}))) or not ((isnull ({c0050}))) or not ((isnull ({c0060}))) or not ((isnull ({c0070}))) or not ((isnull ({c0080}))) or not ((isnull ({c0020}))) or not ((isnull ({c0020}))) then ((not (isnull ({c0100})))) endif |
| v8897_m | match({tB_06.01, c0020}[get LES], "^[A-Z0-9]{18}[0-9]{2}\$") |

These validation rules currently expressed in XBRL formula can be replaced by Table Constraints.

TC Example – 2 – DORA B_02-02 “Contractual arrangements – specific information”

| B_02.01 - Contractual arrangements – General Information | | | | | | |
|--|--|--|--|--|---|---------------|
| Columns | | | | | | |
| | Contractual arrangement reference number | Type of contractual arrangement | Overarching contractual arrangement reference number | Currency of the amount reported in RT.02.01.0050 | Annual expense or estimated cost of the contractual arrangement for the past year | |
| | 0010 | 0020 | 0030 | 0040 | 0050 | |
| Rows | Open Rows | 480197 <Contractual arrangement reference number between the financial entity or, in case of a group, the group subsidiary and the direct ICT third-party service provider> | 483167 [Type of contractual arrangement] | 487321 text | 487512 [Code of the currency] | 483144 €€€ |

| B_02.02 - Contractual arrangements – Specific information | | | | | | | | | | |
|---|--|--|---|---|--|--|---|--|---|---|
| Columns | | | | | | | | | | |
| | Contractual arrangement reference number | LEI of the entity making use of the ICT service(s) | Identification code of the ICT third-party service provider | Type of code to identify the ICT third-party service provider | Function identifier | Type of ICT services | Start date of the contractual arrangement | Sensitiveness of the data stored by the ICT third-party service provider | Level of reliance on the ICT service supporting the critical or important function. | |
| | 0010 | 0020 | 0030 | 0040 | 0050 | 0060 | 0070 | 00170 | 0180 | |
| Rows | Open Rows | 480197 <Contractual arrangement reference number between the financial entity or, in case of a group, the group subsidiary and the direct ICT third-party service provider> | 480201 <Lei code of the entity making use> | 480199 identification code of the ICT third-party service provider | 3296069 [Type of code to identify the ICT third-party service provider] | 480217 <Identifier of the operational/business function of an entity> | 480190 <Type of activity> | 3291598 yyyy-mm-dd | 3291602 [Data sensitiveness] | 3291601 [Level of reliance on the service] |

| B_06.01 - Functions identification | | | | | | | | | | | |
|------------------------------------|---------------------|--|---------------------------------------|-----------------------------|---|--|--|---|--|--------------------------------------|--|
| Columns | | | | | | | | | | | |
| | Function Identifier | Licensed activity | Function name | LEI of the financial entity | Criticality or importance assessment | Reasons for criticality or importance | Date of the last assessment of criticality or importance | Recovery time objective of the function | Recovery point objective of the function | Impact of discontinuing the function | |
| | 0010 | 0020 | 0030 | 0040 | 0050 | 0060 | 0070 | 0080 | 0090 | 0100 | |
| Rows | Open Rows | 480217 <Identifier of the operational/business function of an entity> | 485465 [Type of licenced activity] | 487452 text | 480201 <Lei code of the entity making use> | 485467 [Function is critical or important?] | 485468 text | 485466 yyyy-mm-dd | 487474 # | 487475 # | 485464 [Impact of function discontinuing] |

Specific information for contractual arrangements refers to (1) contractual arrangements general and to (2) functions.

Referential integrity can be enforced using Table Constraints.

Table Constraints 1.0

- Capabilities:
 - Checks on xBRL-CSV file level:
 - Unique key and reference key
 - Mandatory columns
 - Checks on xBRL-CSV column level:
 - Datatype
 - Value constraints: pattern, restricted list, min/max values, ..
- Status at the end of May 2026 is Proposed Recommendation.
- Recommendation expected by 1 August 2026.

Table Constraints – next steps

- Extend to constrain data defined using property groups. EBA uses this approach extensively for their reporting.
- Cover simple validation rules as well
- Target dates for this specification
 - Candidate Recommendation at end of 2026.
 - Recommendation at end of 2027.

Table Constraints next – 1 – property group support

| C_00.01 - Nature of Report (COREP) | | | |
|------------------------------------|----------------------|------------------|---|
| | | Columns | |
| | | Nature of Report | |
| | | 0010 | |
| Rows | Accounting framework | 0010 | 31870 [Accounting standard] |
| | Reporting Level | 0020 | 37969 [Reporting level] |
| | | | VariableID 31870 VariableVID = 5418961 |
| | | | Value chosen from: (qAS:qx2005) National GAAP (qAS:qx2004) IFRS |

```

{
  "documentInfo": {
    "tableTemplates": {
      "C_00-01": {
        "columns": {
          "datapoint": {
            "propertyGroups": {
              "dp31870": {
                "dimensions": {
                  "concept": "eba_met_4.2:qAST"
                },
                "tc:constraints": {
                  "type": "xs:string",
                  "enumerationValues": [ "eba_qAS:qx2004", "eba_qAS:qx2005" ]
                },
                "eba:documentation": {
                  "AllowedValue": {
                    "eba_qAS:qx2004": 1012409106,
                    "eba_qAS:qx2005": 1012409107
                  },
                  "...": "..."
                }
              },
              "dp37969": {
                "factValue": {
                  "dimensions": {},
                  "propertiesFrom": [
                    "datapoint"
                  ]
                }
              }
            }
          }
        }
      }
    }
  }
}

```

Please note, just to illustrate concept

Table Constraints next – 2 – simple validation rule support

- Most validation rules work on data in a single template.
Being able to execute them on the only the data for that template instead of all data in the report will shorten the time required for processing considerably.
- Examples:
 - DNB MSR contains 273 validation rules of which 240 (87%) are single template based.
 - DNB MESRAP contains 693 validation rules of which 583 (78%) are single template based.

| TOC | | | | | | | | | | | | | | | | |
|--|---------------------|--------------------|-------------------------|------|----------------|---------------|-------------|--|-------------------------------|---------------------------|-----------------------|---------------|---|---|------------------------------|-------------------------------|
| T02.02 - Holdings in investment fund shares or units (NON ISIN) | | | | | | | | | | | | | | | | |
| Type of security identifier | Security identifier | Type of instrument | Type of investment fund | LEI | Issuer country | Issuer sector | Issuer name | Positions and transactions | | | | | | | Income | |
| | | | | | | | | Position at the beginning of the month (market value) | Changes during the month | | | | Position at the end of the month (market value) | Dividend amount received during the month | | |
| | | | | | | | | | Transactions | | Revaluation | | | | Other changes (market value) | Rectifications (market value) |
| c001 | c002 | c010 | c020 | c030 | c040 | c050 | c060 | c070 | Purchases (transaction value) | Sales (transaction value) | Exchange rate changes | Price changes | c120 | c130 | | |
| if (Sc010 = 'Money market fund shares/units' then (Sc020 = 'Other') else (true())) | | | | | | | | T02.02: When the instrument type is 'Money market fund shares/units', 'Type of investment fund' must be 'Other'. | | | | | | | | |
| if (matches(Sc030, '[A-Z0-9]{18}[0-9]{2}\$')) then (lei-fn.validate-checksum(\$ c030)) else (false())) | | | | | | | | T02.02: LEI code is invalid. | | | | | | | | |
| if (empty(Sc030)) then (not(empty(Sc040)) and not(empty(Sc050))) else (true())) | | | | | | | | T02.02: When no LEI code is entered, the columns Issuer country and Issuer sector are mandatory. | | | | | | | | |
| if (Sc010 = 'Money market fund shares/units' and empty(Sc030)) then (Sc050 = 'Money market funds' else (true())) | | | | | | | | T02.02: When Type of instrument is 'Money market fund shares/units' and no LEI is entered, 'Issuer sector' must be 'Money market funds'. | | | | | | | | |
| if (Sc010 = 'Non-MMF investment fund shares/units' and empty(Sc030)) then (Sc050 = 'Non MMF investment funds' else (true())) | | | | | | | | T02.02: When Type of instrument is 'Non-MMF investment fund shares/units' and no LEI is entered, 'Issuer sector' must be 'Non MMF investment funds'. | | | | | | | | |
| if (empty(Sc030) and Sc040 = 'Netherlands') then (not(empty(Sc060))) else (true())) | | | | | | | | T02.02: When no LEI code is entered and Issuer country is 'Netherlands' then Issuer name is mandatory. | | | | | | | | |
| Sc080 >=0 | | | | | | | | T02.02: Purchases (transaction value) must be greater than or equal to zero. | | | | | | | | |
| Sc090 >=0 | | | | | | | | T02.02: Sales (transaction value) must be greater than or equal to zero. | | | | | | | | |
| Sc150 >=0 | | | | | | | | T02.02: Dividend amount received during the month can only be negative in exceptional cases. | | | | | | | | |
| iaf:numeric-equal(iaf:numeric-subtract(iaf:sum((Sc070,Sc080,Sc100,Sc110,Sc120,Sc130)),Sc090),Sc140) | | | | | | | | T02.02: Sum of(beginning balance, purchases, exchange rate changes, price changes, other changes, rectifications) - sales should be equal to ending balance. | | | | | | | | |
| if(Sc040='Netherlands' then(Sc001='RIAD') else(true())) | | | | | | | | T02.02: When the issuer country is 'Netherlands', 'Type of security identifier' must be 'RIAD' | | | | | | | | |

Table Constraints next – 2 – simple validation rule support - example

| TOC | | | | | | | | | | | | | | | | |
|--|---------------------|--------------------|-------------------------|------|----------------|---------------|-------------|--|-------------------------------|---------------------------|-----------------------|---------------|---|---|--------|------------------------------|
| T02.02 - Holdings in investment fund shares or units (NON ISIN) | | | | | | | | | | | | | | | | |
| Type of security identifier | Security identifier | Type of instrument | Type of investment fund | LEI | Issuer country | Issuer sector | Issuer name | Positions and transactions | | | | | | | Income | |
| | | | | | | | | Position at the beginning of the month (market value) | Changes during the month | | | | Position at the end of the month (market value) | Dividend amount received during the month | | |
| | | | | | | | | | Transactions | | Revaluation | | | | | Other changes (market value) |
| c001 | c002 | c010 | c020 | c030 | c040 | c050 | c060 | c070 | Purchases (transaction value) | Sales (transaction value) | Exchange rate changes | Price changes | c120 | c130 | c140 | |
| if (empty(\$c030)) then (not(empty(\$c040)) and not(empty(\$c050))) else (true()) | | | | | | | | T02.02: When no LEI code is entered, the columns Issuer country and Issuer sector are mandatory. | | | | | | | | |

```

{
  "...": "...",
  "tableTemplates": {
    "t02.02": {
      "tc:rowAssertions": [
        {
          "test": "if( empty( $c030 ) ) then (not( empty( $c040 ) ) and not( empty( $c050 ) ) else ( true() )",
          "severity": "error",
          "message": [
            {
              "language": "en",
              "text": "T02.02: When no LEI code is entered, the columns Issuer country and Issuer sector are mandatory."
            }
          ]
        }
      ]
    }
  }
}

```

Please note, just to illustrate concept

