



هيئة تنظيم  
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REGULATORY AUTHORITY

# Creating an Analytical Data Model for Banking Supervision

KNIME Data Talks  
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- Unlike statistical data that must be **aggregatable** over entities and time, regulatory returns start from the firms with their **idiosyncrasies**
- But in the recent years more demands for **analytical** use
- Analysis requires context, contrast and comparisons, i.e. **cohesiveness**, and the ability to **quickly explore and find data**

- Multiple measures depending on the variable:
  - Stock:
    - End-of-period balance (EOP)
    - Average daily balance over the period
  - Flow:
    - Period's new flow
    - Cumulative financial-year-to-date flow (FYTD)
- Depending on the firm, the **period can be either monthly or quarterly**

# Analytical data model for banking supervision

## Two types of financial ratios

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'Fraction'  $\frac{STOCK_{eop}}{STOCK_{eop}}$  ,  $\frac{FLOW_{p,ytd,r12m}}{FLOW_{p,ytd,r12m}}$  , example:  $\frac{Fee\ Income}{Total\ Income}$

'Yield'  $\frac{FLOW_{p,ytd,r12m} (annualised)}{STOCK_{p,ytd,r12m} (average\ over)}$  , example:  $\frac{Net\ Profit}{Avg\ Equity} = RoE$

**XBRL:**  
**Mapping**  
**hierarchical**  
**statements**  
**to XML**

**XBRL as seen by systems and humans**

For systems it is an XML file:

What **set of data** it is, which **facts** are provided and what **values** are given to those facts.

For humans it is a table with data:

```

1 <?xml version="1.0" encoding="UTF-8"
2 <xmlns:xlbrl="http://www.xbrl.org/2003/04/xisbrl"
3 <link:role="http://www.xbrl.org/2003/04/xisbrl"
4 <xlbrl:context id="Context1"
5 </xlbrl:context>
6 <xlbrl:entity id="Entity1"
7 </xlbrl:entity>
8 <xlbrl:period id="Period1"
9 </xlbrl:period>
10 <xlbrl:report id="Report1"
11 </xlbrl:report>
12 <xlbrl:measure id="Measure1"
13 </xlbrl:measure>
14 <xlbrl:fact id="Fact1"
15 </xlbrl:fact>
16 </xlbrl:report>
17 </xlbrl:entity>
18 </xlbrl:context>
19 </xlbrl:report>
20 </xlbrl:document>
    
```

A	B	C	D	E	F
S.02.01.02.01 Balance sheet					
					Balance sheet value
					CEB10
					(thousand)
Assets					
	Goodwill			AB110	0
	Deferred acquisition costs			AB220	0
	Intangible assets			AB230	10000
	Deferred tax assets			AB440	20000
	Pension benefit surplus			AB550	50000
	Property, plant & equipment held for sale			AB660	0
	Investments in other entities			AB670	0
	Non-current receivables			AB680	0
	Property (other than for own use)			AB690	0
	Holdings in related undertakings, including participations			AB990	0
				AB100	0
	Equities			AB110	0
	Equities - listed			AB120	0
	Equities - unlisted			AB130	0
	Bonds			AB140	0
	Government Bonds			AB150	0
	Corporate Bonds			AB160	0
	Structured notes			AB170	0
	Other interest securities			AB180	0



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Tutorial: The value of XBRL for supervision

Jun 2019

From: [P.J. Hulst, DeNederlandscheBank \(2019\): Value of XBRL for banking supervision](#)

## Example

From regulation:

Net carrying amount of not yet impaired but already past due (over 180 days but less than a year) debt securities held, issued in EUR by MFIs located in EMU with original maturity under one year, measured at amortised cost and relating only to business activities conducted in EU?

<b>Locations of activities:</b>	<b>Portfolios:</b>	<b>Impairment status:</b>	<b>Time reference:</b>
All / Not-applicable	Total (...)	All / Not-applicable	Current period end
EU	Fair value through profit or loss	Impaired	Previous period end
Other than EU (...)	Amortised cost	Unimpaired	Current period
<b>Base terms:</b>			<b>Past due periods:</b>
Assets			All
Liabilities			< 180 days
Equity			≥ 180 days < 1 year
Off-balance sheet			≥ 1 year
Exposures			
<b>Categories:</b>			<b>Original maturity:</b>
Total (...)			All
Cash			< 1 year
Loans			≥ 1 year < 2 year
Debt securities			≥ 2 years
Equity instruments			
Tangible and intangible			<b>Counterparty sectors:</b>
Other than (...)			All / Not-applicable
			MFIs
			MMFs
			MFIs other than MMFs
			Central Administration
			Other general government
			Non-MMFs other than government
<b>Amount types (metric):</b>			<b>Counterparty residences:</b>
Carrying amount			All / Not-applicable
Gross carrying amount			EMU
(Specific allowances)			Other than EMU (...)
(Collective allowances)			
<b>Original currencies:</b>			
All / Not-applicable			
EUR			
Other than EUR			

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DeNederlandscheBank

EUROSYSTEM

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- Calculated **CYTD out of FYTD**
- Interpolated and extrapolated **quarterly data into monthly estimates**
- Calculated **rolling 12 month values** for all variables (sum for flows, mean for stocks) for easy construction of financial ratios
- Created a **descriptive note** of all estimations and present it to users as alongside the values
- Presented users with **dimension and primary element hierarchies** for better navigation



DEMO



- Development process was **organic**, started with a vision of how should it **feel** to use the data
- This would have been **challenging to deliver in a project setting** in a reasonable time and cost
- **Further experimentation** can be performed continuously on the side
- The workflow is its own, **exact and complete documentation**



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# Analytical data model for banking supervision

## Harmonising financial years

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- Fortunately, all firms' financial year ends are also quarter-ends
- Further, the issue exists only for FYTD
- Formula:

$$CYTD = \begin{cases} FYTD - FYTD_{YE-1}, \\ FYTD + FY(-1) - FYTD_{YE-1}, \end{cases}$$

*when FY started last year*

*when FY started this year*



# Analytical data model for banking supervision

## Calculations performed

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Measure	Description of the calculation	
	Stock	Flow
<b>EOP</b>	End of period balance as reported (monthly reports). For quarterly reports, linear interpolation of the adjacent quarter-end values. When a firm becomes operational during a quarter, the first quarter's value is retrospectively replicated in the first operational months. If the monthly reports are currently being reported for an inter-quarter month, the most recent quarter-end value is copied over to that month as well.	Not relevant.
<b>P1M</b>	Average daily balance as reported (monthly reports). Constructed as $(EOP - EOP_{t-1})/2$ when average daily balance is not reported for the variable. For quarterly reports, the reported average daily balance over a quarter is replicated over the three months. When a firm becomes operational during a quarter, the first quarter's value is retrospectively replicated in the first operational months. If the monthly reports are currently being reported for an inter-quarter month, the most recent quarter-end value is copied over to that month as well.	Monthly flow as reported. For quarterly reports, the reported flow divided by 3. If the monthly reports are currently being reported for an inter-quarter month, the most recent quarter-end value divided by 3 is copied over to that month as well.
<b>FYTD</b>	Average daily balance in the financial year to date, calculated from the relevant P1M values.	Cumulative flow of the financial year to date as reported. For quarterly reports, linear interpolation of adjacent quarter-end cumulative flows.
<b>CYTD</b>	Average daily balance in the calendar year to date, calculated from the relevant P1M values.	Cumulative flow of the calendar year to date. This is calculated from the reported FYTD figures. Most firms' financial years align with calendar years in which case $CYTD = FYTD$ . In exceptional cases when a firm's financial year differs from calendar year, CYTD is calculated using the reported FYTD values, but deducting any flow from the previous calendar year.
<b>R12M</b>	Average daily balance in the past 12 months calculated from the relevant P1M values.	Cumulative flow of the past 12 months. Aggregated from P1M values with a possible adjustment from subsequent FYTDs