

# Finance ontology

One can bury his richness,  
One can hide his treasures,  
Sharing them is the most enjoyable  
way of ownership.

# Risk factor

## There is no information in the data

- Systematically and periodically one is drowned in data, giving a false feeling of control and safety.
- The data itself is correct, but not in an information context.
- The business meaning and risks are hidden.
- Information is requested, data is provided.

# Risk factor internal fraud

- The internal functioning is **not justifiable under control**
- The used **data models are 3D** instead of 4D, thus without taking into account the time dimension.  
The split of functions, which is wanted in each normal financial transaction environment, is only existing at a certain point in time.

# Risk factor manipulation/creative interpretation

- **Underlying values** of financial instruments are **overrated**
- Disturbing **ratio calculations can be fooled** with creative solutions as transfer of risk:
  - securitization of doubtful debts is one of the methods of risk transfer.
  - the parts of funds containing those debts are swiftly placed with friendly institutions but finally ... one stays with the doubtful debts of the other

# Risk factor production “accidents”

- **Risk analysis** has today nothing to do with production control.  
No model is requiring management to prove that production is under control !
- **Reporting about processes** with their linked risks does not occur, compare to accounting statuses
- There are **no benchmarks** for processes nor for production risks in most service industries

# Risk factor

## no business rules enforcement

Impossibility to provide:

- A description of the business rules
- The conceptual data model which enforces those rules
- The physical data model with the indication of the utilities enforcing the conceptual model

# Risk factor

## unable to cope with changed business model

- The fast evolution and production of **new services** with their specific risks (derived financial products) is not coped with since the generic data models are lacking.
- Instead the existing models based on existing products are used in a creative way.
- The models are not reflecting reality any

# Risk factor

## no requests for change for valid business cases

- The functional need cannot be translated into functional concepts
- The functional concepts cannot be translated into physical
  - Entities, attributes and relations on database level
  - Transformations on procedural or object level
- An impact analysis cannot be completed

# Risk factor no history reconstruction possibilities

- The version of the processes and/or products in the past is not available.
- The used **data models are 3D** instead of 4D, thus without taking into account the time dimension.
- There is no audit nor justification possible for past actions

# Risk factor testing process

- Unnecessary tests are delaying the installation of new releases
- Necessary tests are not performed since the relationships between applications are unclear
- Non-regression testing is not taking into account the scope of all real impacts.

# Risk factor

## excessive lead time of change implementation

- Even mandatory modifications cannot be delivered in time.
- The IT systems are the only memory of the business
- Describing the business rules and/or products can only be done by scanning the program code
- The actual production and other processes are not documented
- Transformation descriptions AS IS/TO BE cause headaches

# Risk factor

## the information is not accessible

- Literature instead of documentation
- Documentation without methodology
- No scope limitation, not in width, nor in depth with overlapping and shortcomings as a consequence.
- Applications are documented instead of end-to-end processes
- No link between applications
- No global picture.

# Risk factor

## multiple specification changes

- Many changes to a customer specification are inherent to service production: compare a stock purchase order to a car purchase order
- Versioning of the service agreement with the customer is not updated timely: Straight Trough Processing of all changes on the full chain are necessary
- Modifications are not :
  - Documented by the customer (phone orders,...)
  - Automatically approved by the supplier of services
  - Registered in time
  - Integrated in the production chain

# Risk factor

## multiple service providers

- Inherent to service production. Examples in the financial sector are: brokers, paying agents, clearing and settlement houses, custodians, organisations like SWIFT, markets,...
- The processes of the third parties are not synchronised with the owns
- In case of failure in the chain the origin is not immediately detected

# Risk factor

## confusing terminology

- Product descriptions are incomplete, incorrect or create unfulfillable expectations
- Comparisons of products between suppliers are impossible, the same goes with our customers
- Reporting to authorities, auditors,...: the exact content requirement is unknown
- It's impossible to create a catalogue “ad hoc” of complex products.
- A structured transmission of product data between computer systems is not in all cases possible

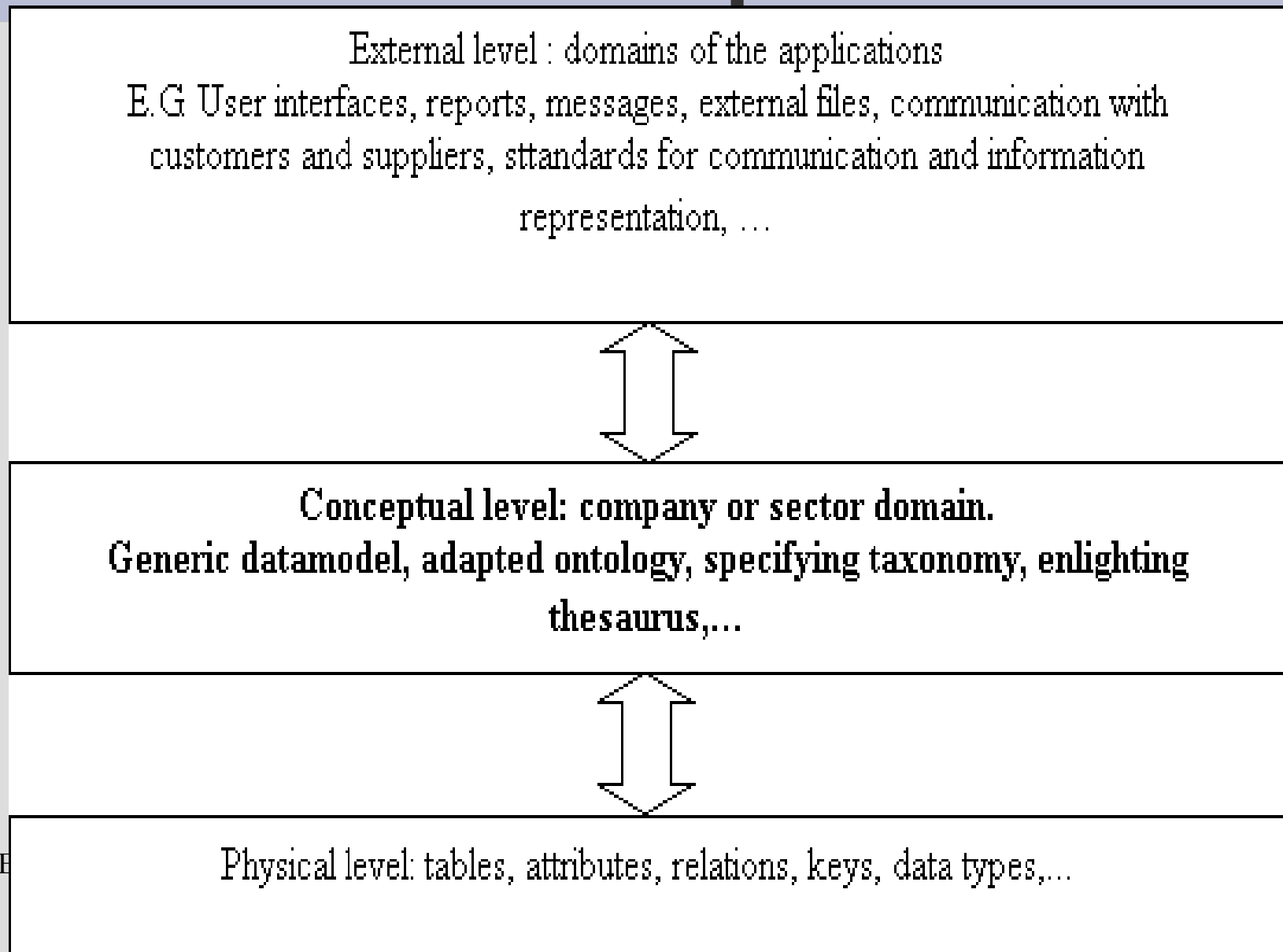
# Risk factor simplification of technicalities

- The level of communication of the technical staff to the management is of such a “high level” that the subject becomes pure fictitious. In the finance world they know about fictitious values.
- Higher management does not realize any more the product and production risks and approves unknown methods.

# Where do these risks lead to ?

- Loss of trust
- Cut of credit lines
- Bankruptcy
- Crisis in the sector
- Worldwide spread of the crisis
- Customers going broke
- Countries' economy declining
- World economy declining
- Economy lands in a recession
- Recession spreads worldwide

# Where should a solution intervene ? Conceptual level.



# What is the purpose of a solution ?

An updated documentation and suitable data model is not only a sign of sound governance, but also a condition for:

- Risk management
- Process control
- Quality control
- Efficiency in product development
- Effective communication

# Criteria for a solution

## general criteria

- Accessible by men and machines
- Understandable by men and machines
- Graphical representation possibilities

# Criteria for a solution on the level of the data model

The data model should:

- be generic for flexibility
- contain a time dimension for historization and versioning
- allow standardized reporting and monitoring
- be universally applicable in the activity sector
- should point to shortcomings and errors at sight through its structure

# Criteria for a solution on the level of the definitions

The definitions shall be in the form of a thesaurus.

Meaning a big philological collection so that all aspects of the activity with interrelations are covered. Containing:

- a complete dictionary (lexicon) with unambiguous and precise definitions
- integrating business rules
- a taxonomy: sub/super structure of categories as variety, nature, concept, ...

# The journey towards an optimal solution.

Once the criteria established, an odyssey starts in the land of:

- Philosophers on the nature of things
- Mathematicians on descriptive logics
- Standards applied else-where
- Possibilities in communication
- IT-architecture and programming techniques

To find a target solution fulfilling every request and more...

# What is the solution ?

- The implementation of an ***ontology***.
- An ontology is a branch from Greek philosophy: the science of the common properties of things.
- In the field of information management the science is applied to properties of objects, concepts and methods (verbs).
- Resulting on the physical level to objects, the relations between objects and the limitations of the properties (data type, referential integrity, indexes, ...)

# How does an ontology satisfy our criteria ? (part 1)

It contains a generic data model and proves:

- That one obtains a clear view while modelling concepts so that communication becomes possible between:
  - Users
  - Machines
- that analysing the concept in his atomic properties makes it also as generic as possible
- that a time dimension is inherently possible through annotation properties on concepts and relations

# How does an ontology satisfy our criteria ? (part 2)

- Is accessible to men and machine using:
  - Browsing techniques
  - Queries through a specific query language: SPARQL and related extensions of it
  - The chosen ontology language, OWL or web ontology language, allows combinations of ontologies to contribute to the semantic web
- A taxonomy is an inherent part of an ontology
- Contains the capacity to build a thesaurus through annotation properties on concepts, relations and other properties.

# What are the additional advantages of an ontology ?

- When individuals are added to the concepts we obtain ***Knowledge bases***
- **Reasoners** are pieces of applied mathematical software to :
  - generate inferred knowledge based on the knowledge bases
  - validate the asserted ontology
  - **validate the business meaning of data**
- Using owl language we'll be part of the ***Semantic web***
- Uses most advanced ***Descriptive logics***
- Ontology ***engineering software*** available
- Different ***graphical representations*** possible

# How is an ontology defined ?

Branch of the Greek philosophy which has the purpose to describe the nature of things.

The description is done on basis of atomic facts and relations about a "thing".

This means you won't find combined knowledge in an ontology model: coding we are used to will be broken up into separate knowledge.

Relations however form a cornerstone about the building of knowledge through ontologies.

This approach enables a clearer view on "things"

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allowing interpretations and deductions by the user.

# What additional concepts are used in an ontology ?

Besides the earlier cited ones:

- **Classes:** All classes are concepts, which can have physical aspects.

Classes are grouping kinds of individuals, called instances, with common definition-levels and relations.

- **Context:** the environment in which the statements are valid.

Risk shall have a different meaning in a finance ontology compared to an insurance ontology.

In the first case we will think about solvability and liquidity risks, while in the second case we'll think

# What assumptions are used in ontologies ?

Open world assumption with consequences:

- all individuals matching at least one criterion are members of the group (create universal relations besides the existential ones)
- all values in a group are synonyms (make the subclasses and/or individuals distinct if the open world assumption is not valid)

# User interfaces

- There are different user interfaces.
- The best ones have been developed by David Decraene
- You can find my preferred from his hand on the website containing the Finance ontology:  
<http://www.fadyart.com/ontologies/FinanceDemo.html>
- More examples can be found at his website:  
<http://www.ontologyonline.org/>
- Following slides give you a glimpse.  
A **user manual is advisable** and can be found on the website  
<http://www.fadyart.com/FinanceOntologyManual.htm>

# Finance Ontology

Securities handling ontology

Construction phase 1: Financial instruments

Construction wharf: ISO 10962 Classification of Financial Instrument codes

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Description of the ontology

List of classes

Classes Properties Individuals SPARQL-DL

[Other Entities](#), [Transparent Entity](#), [Entity](#), [Principal](#), [Finance](#), [CFI Type Of Interests](#), [CFI Financial Future Underlying Asset](#), [CFI Type Of Scheme](#), [CFI Sponsoring](#), [CFI Attribute1 None](#), [CFI Structured Or Hybrid Instrument Underlying Asset](#), [CFI Voting Right](#), [CFI Commodity Future Underlying Asset](#), [CFI Other Assets](#), [CFI Attribute1](#), [CFI Other Categoryt Underlying Asset](#), [CFI Further Grouping](#), [CFI Closed Or Open End Fund](#), [CFI Future Standardized](#), [CFI Attribute3](#), [CFI Group Future Financial](#), [CFI Group Future](#), [CFI Category Option](#), [CFI Category Equity](#), [CFI Category Future](#), [CFI Category Mortgage Backed Debt](#), [CFI Category Other Miscelenaous](#), [CFI Category](#), [CFI Category Debt Instruments](#), [CFI Category Entitlement Right](#), [CFI Category Treasury Debt](#), [CFI Category Package Unit](#), [CFI Category Asset Backed Debt](#), [CFI Category Municipal Debt](#), [Type Of Loan](#), [Value Partition](#), [CFI Goup1 Of Funds](#), [CFI Group Of Preferred Shares](#), [CFI Group Of Depositary Receipts](#), [CFI Group Of Common Share-LP Units](#), [CFI Goup2 Of Funds](#), [CFI Group Equity](#), [CFI Group Treasury Debt](#), [CFI Group Asset Backed Debt](#), [CFI Group Mortgage Backed Security](#), [CFI Group Entitlement Right](#), [CFI Group Other Miscelenaous](#), [CFI Group Option](#), [CFI Group Debt Instrument](#)  
... [55 more]

Description of the class selected via the List of classes or the Taxonomy

Treeview:  Navigation Bar:

Treeview

Finance

- Principal
- Value Partition
- Party
- Financial Instrument

Taxonomy

Description of Finance

An ontology on securities handling to ensure common understanding of terminology, control and monitoring of risks, processes and procedures in the largest field of application.  
**Terms:** Finance

Query input field

Enter Search Terms here

[Type Of Scheme](#), [CFI Sponsoring](#), [CFI Attribute1 None](#), [CFI Structured Or Hybrid Instrument Underlying Asset](#), [CFI Voting Right](#), [CFI Commodity Future Underlying Asset](#), [CFI Other Assets](#), [CFI Attribute1](#), [CFI Other Categoryr Underlying Asset](#), [CFI Further Grouping](#), [CFI Closed Or Open End Fund](#), [CFI Future Standardized](#), [CFI Attribute3](#), [CFI Group Future Financial](#), [CFI Group Future](#), [CFI Category Option](#), [CFI Category Equity](#), [CFI Category Future](#), [CFI Category Mortgage Backed Debt](#), [CFI Category Other Miscelenaous](#), [CFI Category](#), [CFI Category Debt Instruments](#), [CFI Category Entitlement Right](#), [CFI Category Treasury Debt](#), [CFI Category Package Unit](#), [CFI Category Asset Backed Debt](#), [CFI Category Municipal Debt](#), [Type Of Loan](#), [Value Partition](#), [CFI Goup1 Of Funds](#), [CFI Group Of Preferred Shares](#), [CFI Group Of Depository Receipts](#), [CFI Group Of Common Share-LP Units](#), [CFI Goup2 Of Funds](#), [CFI Group Equity](#), [CFI Group Treasury Debt](#), [CFI Group Asset Backed Debt](#), [CFI Group Mortgage Backed Security](#), [CFI Group Entitlement Right](#), [CFI Group Other Miscelenaous](#), [CFI Group Option](#), [CFI Group Debt Instrument](#)

... [55 more]

Treeview:  Navigation Bar:

Treeview

- Finance
  - Value Partition
    - ISO Codes
      - Classification Of Financial Instruments
        - CFI Attribute1
          - CFI Type Of Interests

**1. Select the class to be investigated**

**2. Check the description of the class**

**3. Distinct classes on the same level from the selected one**

**5. Consult the documentation on the hovered individual (instance)**

I-Increasing Rate

Description of

owl:Class CFI Type Of Interests

The calculation method of the instruments.

The interest rate is periodically increased during the term of the loan.

**Terms:** CFI Type Of Interests

**Disjoint With:** [CFI Financial Future Underlying Asset](#), [CFI Type Of Scheme](#), [CFI Sponsoring](#), [CFI Attribute1 None](#), [CFI Structured Or Hybrid Instrument Underlying Asset](#), [CFI Voting Right](#), [CFI Commodity Future Underlying Asset](#), [CFI Other Assets](#), [CFI Other Categoryr Underlying Asset](#), [CFI Further Grouping](#), [CFI Closed Or Open End Fund](#)

**Instances**

P-Payment In Kind, U-Step-Up, H-Inflation Indexed, Z-Zero Discount, T-Fixed To Float, F-Fixed Rate, X-Zero Then Fixed DEFD, G-Floating, D-Step-Down, R-Interest Ratings Linked, V-Variable, I-Increasing Rate

**4. Hover the instance you want documented**

Built with jOWL

This page is made by [David Dezaene](#) with the tools you can find on his fantastic website <http://www.ontologyonline.org/>

The presentation is visible with Internet Explorer 7, Firefox (2 & 3), Safari (Webkit-Browsers).

Thanks David!

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[Type Of Scheme](#), [CFI Sponsoring](#), [CFI Attribute1 None](#), [CFI Structured Or Hybrid Instrument Underlying Asset](#), [CFI Voting Right](#), [CFI Commodity Future Underlying Asset](#), [CFI Other Assets](#), [CFI Attribute1](#), [CFI Other Categoryt Underlying Asset](#), [CFI Further Grouping](#), [CFI Closed Or Open End Fund](#), [CFI Future Standardized](#), [CFI Attribute3](#), [CFI Group Future Financial](#), [CFI Group Future](#), [CFI Category Option](#), [CFI Category Equity](#), [CFI Category Future](#), [CFI Category Mortgage Backed Debt](#), [CFI Category Other Miscellenaous](#), [CFI Category](#), [CFI Category Debt Instruments](#), [CFI Category Entitlement Right](#), [CFI Category Treasury Debt](#), [CFI Category Package Unit](#), [CFI Category Asset Backed Debt](#), [CFI Category Municipal Debt](#), [Type Of Loan](#), [Value Partition](#), [CFI Goup1 Of Funds](#), [CFI Group Of Preferred Shares](#), [CFI Group Of Depository Receipts](#), [CFI Group Of Common Share-LP Units](#), [CFI Goup2 Of Funds](#), [CFI Group Equity](#), [CFI Group Treasury Debt](#), [CFI Group Asset Backed Debt](#), [CFI Group Mortgage Backed Security](#), [CFI Group Entitlement Right](#), [CFI Group Other Miscelenaous](#), [CFI Group Option](#), [CFI Group Debt Instrument](#)

... [55 more]

Treeview:  Navigation Bar:

Treeview

- Finance
  - Value Partition
    - ISO Codes
      - Classification Of Financial Instruments
        - CFI Attribute1
          - CFI Type Of Interests

Description of CFI Type Of Interests

The calculation method of the interest on debt- and similar instruments.

**Terms:** CFI Type Of Interests

**Disjoint With:** [CFI Financial Future Underlying Asset](#), [CFI Type Of Scheme](#), [CFI Sponsoring](#), [CFI Attribute1 None](#), [CFI Structured Or Hybrid Instrument Underlying Asset](#), [CFI Voting Right](#), [CFI Commodity Future Underlying Asset](#), [CFI Other Assets](#), [CFI Other Categoryt Underlying Asset](#), [CFI Further Grouping](#), [CFI Closed Or Open End Fund](#)

**Instances**

[P-Payment In Kind](#), [U-Step-Up](#), [H-Inflation Indexed](#), [Z-Zero Discount](#), [T-Fixed To Float](#), [F-Fixed Rate](#), [X-Zero Then Fixed](#), [DEFD](#), [G-Floating](#), [D-Step-Down](#), [R-Interest Ratings Linked](#), [V-Variable](#), [I-Increasing Rate](#)

sh

<b>CFIGroupOfPreferredShares</b>	<i>owl:Class</i>
Terms: CFI Group Of Preferred Shares	
<b>CFIGroupOfCommonShare-LPUnits</b>	<i>owl:Class</i>
Terms: CFI Group Of Common Share-LP Units	
<b>Share</b>	<i>owl:Class</i>
Terms: Share	
<b>CFIOwnership</b>	<i>owl:Class</i>
Terms: CFI Ownership	

**Start typing, the names of the classes matching your text appear. You select the requested one by clicking your option.**



[CBO CFO](#), [V-Credit Card Receivable](#), [A-Automobile Loan](#), [H-Home Equity Loan](#), [S-Student Loan](#), [N-Non-Standardized Future](#), [M-Other Right](#), [B-Subordinated](#), [R-Entitlement Right](#), [M-Other Miscellenaous](#), [C-Contingent Right](#), [C-Cash](#), [K-Fixed Maturity With Put](#), [A-Allotment Right](#), [A-Registered Depository Receipts](#), [T-Government Treasury](#), [T-Underlying Commodities](#), [B-Bond](#), [Foreign Loan](#), [Eurobond Loan](#), [Domestic Loan](#), [Private Loan](#), [Unknown Loan](#), [P-Purchase Right](#), [M-Underlying Asset Structured Instrument Other](#), [Z-Variable Annuities](#), [I-Accredited Investor](#), [I-Interesst](#), [B-Mortqage Backed Debt](#), [B-Underlying Asset Structured Instruments Basket](#), [M-Option On Other Underlying Assets](#), [U-Municipal RAN](#), [W-Option On Swaps](#), [R-REP Os](#), [Z-Bearer Depository Receipt](#), [C-Option On Currencies](#), [F-Fully Paid](#), [E-3c7 And Regulation S](#), [Y-Municipal BAN](#), [F-Forward](#), [E-Commercial Paper](#), [T-Traditional Warrant](#), [NL](#), [P-Repavment At Maturity Perpetual](#), [S-Sponsored](#), [T-Capital Shares](#), [D-Underlying Asset Structured Instrument Debt And Interest](#), [S-Standardized Future](#), [M-Underlying Miscellaneous](#), [I-Insurance Policies](#), [P-Spreads](#), [C-Closed End](#), [M-Miscelenaous Other Assets](#), [T-Treasury Debt](#), [M-Other Option](#), [P-Partly Paid](#), [B-Bermuda](#), [M-Debt Others](#), [O-Collateral Mortgage Obligation](#), [T-Remic](#), [W-Whole Loan](#), [S-SMBS Strips](#), [C-Commercial Mortgage Backed](#), [P-Mortqage Pass Thru CTF](#), [G-Growth Fund](#), [P-Precious Metal Receipt](#), [N-Fully Paid No Par](#), [P-Private144 A](#), [W-Swaps](#), [W-Warrant](#), [X-No Attribute1](#), [F-Future](#), [C-Call Option](#), [S-Underlying Asset Structured Instruments Stock Equity](#), [F-Form144 A](#), [Q-Real Estate Investment Tr](#), [I-Installment Receipts](#), [U-Unsponsored](#), [E-Refunding](#), [D-Debenture](#), [V-Government Agency](#), [D-Dividend](#), [S-Treasury Strips](#), [F-Financial Future](#), [FR](#), [E-Enhanced Vote](#), [T-Option On Commodities](#), [L-Front End Load](#), [V-Voting Rights](#), [F-Fixed Maturity](#), [N-Normal Rate Income](#), [R-Restricted](#), [U-Unrestricted](#), [I-Underlying Asset Structured Instrument Indice](#), [R-Ratings Linked](#), [U-Unit Investment Trusts](#), [F-Mutual Funds](#), [A-According To Formula](#), [M-Other Assets](#), [C-Cash Delivery](#), [D-Debt Instruments](#), [O-No Load](#), [D-Back End Load](#), [N-Non Voting Rights](#), [BNB](#), [C-Form3c7 And144 A](#), [D-Underlying Debt And Interest](#), [S-Option On Stock Equities](#), [N-Interest](#), [P-Put](#), [L-Common Shares Class](#), [J-Municipal TAN](#), [L-Floating Rate Income](#), [BE](#), [saving Bond](#), [EUR](#), [E-Equity](#)

The description of the individual (also called instance) is shown upon selection of the individual. The individual is selected by clicking its name in the list.

#### Description of X-Zero Then Fixed DEFD

**owl:Class** CFI Type Of Interests

At issue of the loan, the interest covering part of the loan term is prepaid by means of an issue premium, from a certain moment on, fixed interest will be paid on the facial value of the bond.

Construction phase 1: Financial instruments

Construction wharf: ISO 10962 Classification of Financial Instrument codes

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Classes

Properties

Individuals

SPARQL-DL

Enter a query:

Type(S-Secured ?class)

Results

?class : CFIGuarantee

Number of results: 1

Syntax

- o Type(?a, ?b)
- o PropertyValue(?a, ?b, ?c)
- o Class(?a)
- o ObjectProperty(?a)
- o DatatypeProperty(?a)

Examples: see [jOWL SPARQL-DL Test Suite page](#)

1. Feed the query

2. Capture the results

# Financing of the Finance ontology

- Through sponsoring development, personalised specifications can be included in the ontology.
- Through advertising on the website <http://www.fadyart.com/>
- Please contact us [info@fadyart.com](mailto:info@fadyart.com) for conditions

# Thank you for your attention

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