A Model Toward Formalizing and Monitoring Compliance of Investment Funds Activities

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FinTech National Centre of Excellence in Research

Context

Context: NCER - Fintech

FinTech
National Centre of
Excellence in Research

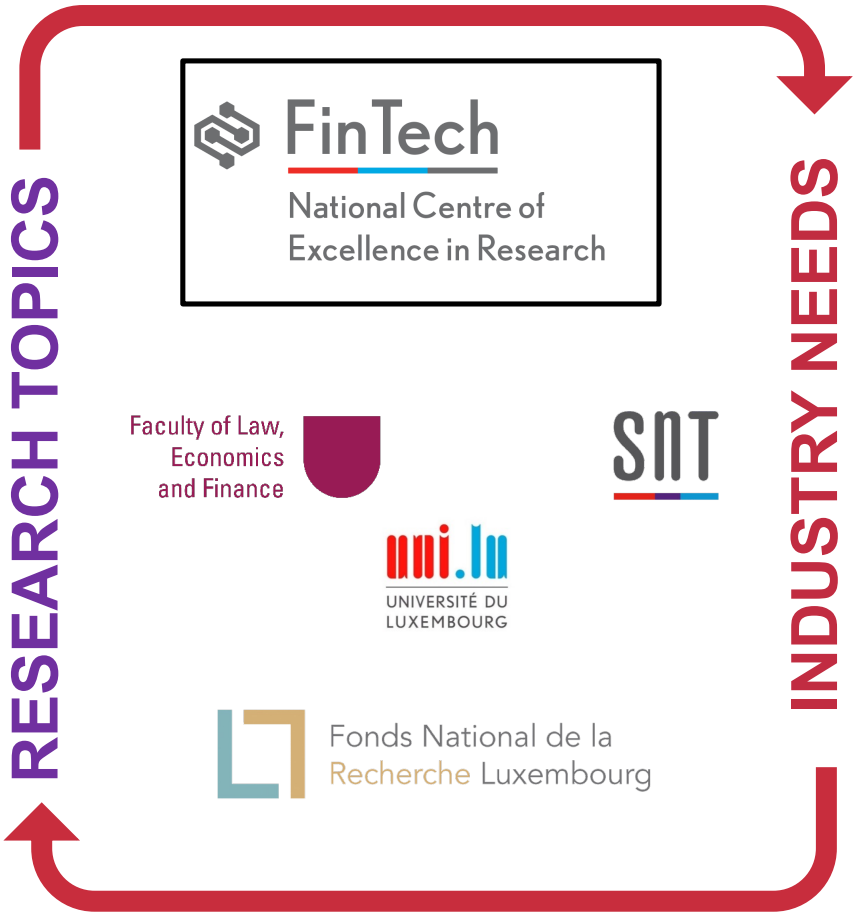
New Frontiers for Digital and Automated Finance

Regtech and Compliance by Design

Financial inclusion

Trust and Security

AI sandbox



Business associations

Public authorities incl. regulators

Financial services actors

Fintechs & Fintech centres

Local ICT players

Meet our Interdisciplinary Research Team

Domenico Bianculli
Associate Professor

Sallam Abualhaija
Research Scientist

Marcello Ceci
Research Associate

Nicolas Sannier
Research Associate

SnT
securityandtrust.lu

- ✓ SE
- ✓ RE
- ✓ Applied AI & NLP
- ✓ MDE
- ✓ Compliance checking
- ✓ Legal Informatics

Faculty of Law, Economics and Finance

- ✓ Sustainable Finance
- ✓ Banking Law
- ✓ Financial Regulations
- ✓ FinTech
- ✓ Domain Expertise

Michael Halling
Chair in Sustainable Finance

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Motivation

RUMOFA: Runtime Monitoring of Fund Activities (Context)

- Investment fund activities
  - Issue/redemption of shares to collect/redeem investors money to build the fund's capital (assets)
  - Investing the capital on behalf of the investors in diverse investment opportunities to make the capital grow

- Many aspects of funds operations should be monitored
  - Compliance with the law (regulators)
  - Compliance with the contract (investors)

Why Monitoring Fund Activities?

- Compliance with the law
  - Stability and integrity of the market
  - Protection of investors' rights
  - Anti-money laundering

- Compliance with the contract
  - Alignment with the fund investment objectives and strategies
    - Performance measurement: alignment with benchmarks, fund composition, etc.
  - Fund remuneration based on fees whose calculation is based on dynamic information
    - "Net Asset Value"-based pricing (daily update)

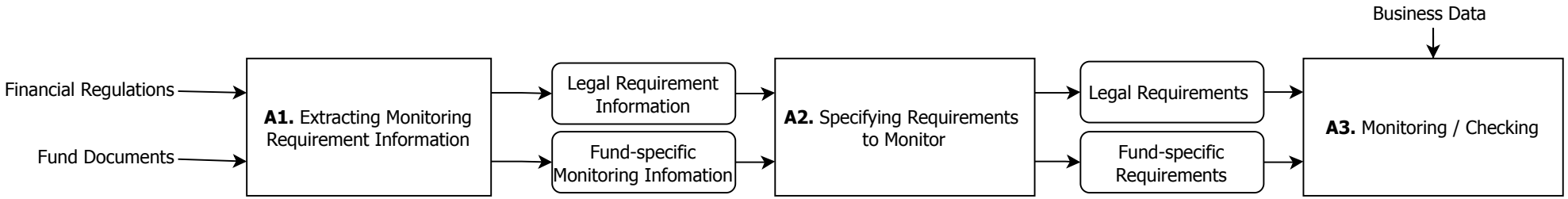
Problem

- Compliance checking is performed periodically through audits and reporting
- Limited tool support for checking/monitoring compliance
- Lack of external visibility on potential deviations and their potential impacts
  - At best or to the earliest, through fund statement disclosure or through quarterly, semi-annual and/or annual reports

Our Vision

Devise intelligent automation strategies that

- Have the potential to improve legal compliance and risk management processes
- Enable new automated mechanisms for financial supervision



General Challenges for Monitoring (1/2)

Multiple sources of compliance requirements to monitor

- The law (applicable to all investment funds)
  - e.g., the UCITS directive for UCITS funds

  A UCITS shall invest no more than 5% (10%) of its assets in transferable securities or money market instruments issued by the same body

- The fund strategy and investment policy (self-imposed constraints that are specific to the fund)
  - documented in the fund's prospectus and sub-funds' Key Information Documents
  - Possible fees (if any), portfolio composition (if any), restriction on instruments (if any), etc.

  The Sub-fund invests at least two-thirds of its assets in fixed income securities (including zero-coupon bonds, subordinated bonds, covered bonds perpetual bonds, and securities issued on a discount basis and floating rate securities) of corporate issuers which are domiciled in Europe or which conduct the majority of their business activities there.

General Challenges for Monitoring (2/2)

Multiple sources of monitoring data to analyze

Direct transactions and logs

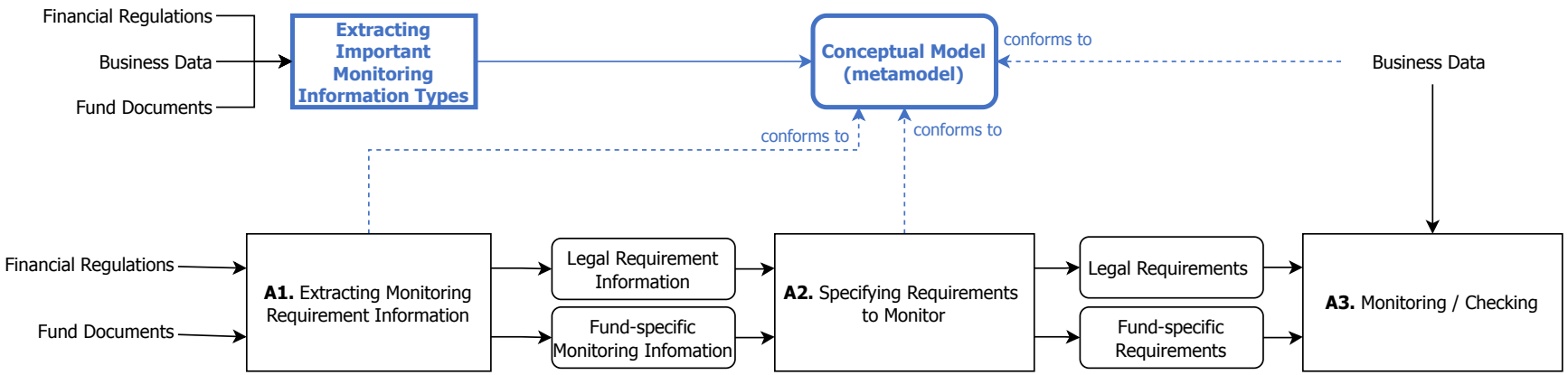
Financial information providers

Complexity of data analysis

- Data from various places in the world
- possibly different terminology and discrepancies in legal bases

Approach

Contribution: A Conceptual Model for Harmonizing the Landscape



Building the Conceptual Model

Case Study on monitoring UCITS fund holding composition

- Applicable legislation
  - Directive 2009/065/EC
  - National application of the directive (law of 17 December 2010 in Luxembourg)

- Funds: any UCITS fund (registered in Luxembourg)
  - (Sub)funds investment policies in KIDs and prospectuses

- Monitoring Investment Data
  - No actual partnered asset manager / fund that would provide actual business data
  - Information from financial information providers available
    - Aggregated data

Methodology

Three iterations for building the model

- One iteration for each information source
    - Legal requirements
    - Information from data providers
    - Fund-specific requirements

- Extraction of concepts through qualitative study and open coding
- Design/refinement of the conceptual model
- Discussion/validation after each iteration through workshops with all the projects participants
    - to ensure good understanding and discuss possible ambiguities
    - clarify business-related concerns

Methodology

Three iterations for building the model

1. Legal Text

Article 50

1. The investments of a UCITS shall comprise only one or more of the following:

(a) transferable securities and money market instruments admitted to or dealt in on a regulated market ...

(b) transferable securities and money market instruments dealt in on another regulated market in a Member State, ...

(e) units of UCITS authorised according to this Directive or other collective investment undertakings ...

(f) deposits with credit institutions which are repayable on demand or have the right to ...

Concept Extraction

Article 50

1. The investments of a UCITS shall comprise only one or more of the following:

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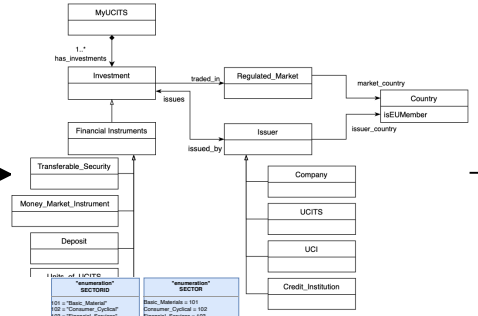
(e) units of UCITS authorised according to this Directive or other collective investment undertakings ...

(f) deposits with credit institutions which are repayable on demand or have the right to ...

instruments
market/country
issuer
instruments properties

Model Building / Revision



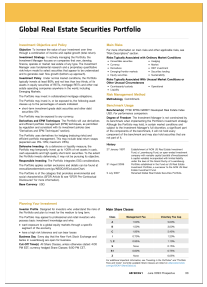
Discussion Model Validation

2. Business Data

detailholdingtypeid	detailholdingtype
B	Bond - Corporate Bond
BG	Bond - Undefined
BR	Bond - Bank Loans
BT	Bond - Gov't/Treasury
C	Cash
CH	Cash - Currency
CD	Cash - CD/Time Deposit
CL	Currency - Future
CU	Currency - Forward
DB	Bond - Option (Call)
DD	Commodity
DH	Equity - Option (Call)
E	Equity
EL	Equity Index - Future
EQ	Equity - Undefined
ER	Equity - REIT
EU	Equity - Units

globalsectorid	globalsector

3. Fund Document



1. Eliciting Concepts from the Law

Analyzing Art. 50 of the UCITS Directive

- Main provision on UCITS authorized investments (1000+ words)

Article 50

instruments

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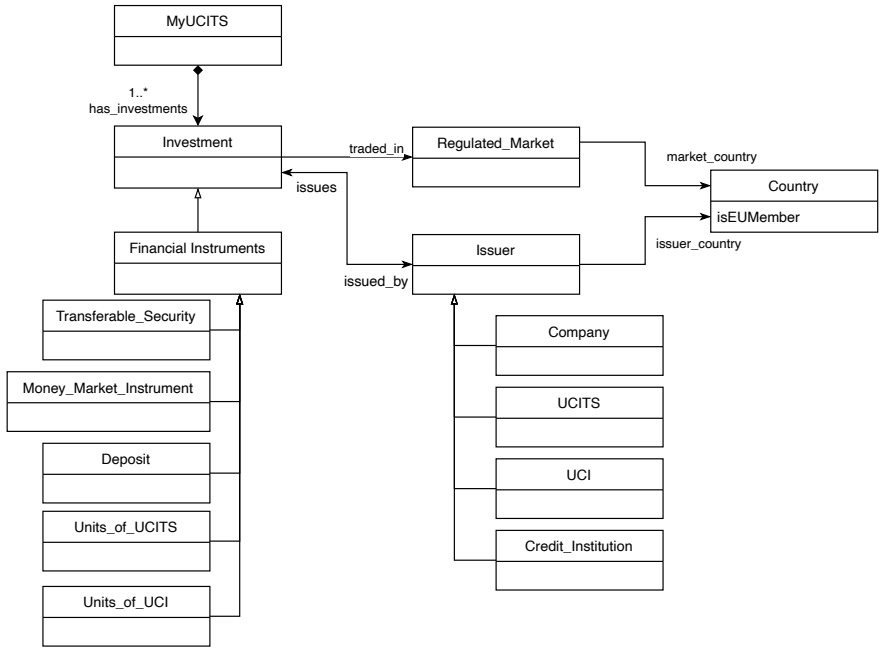
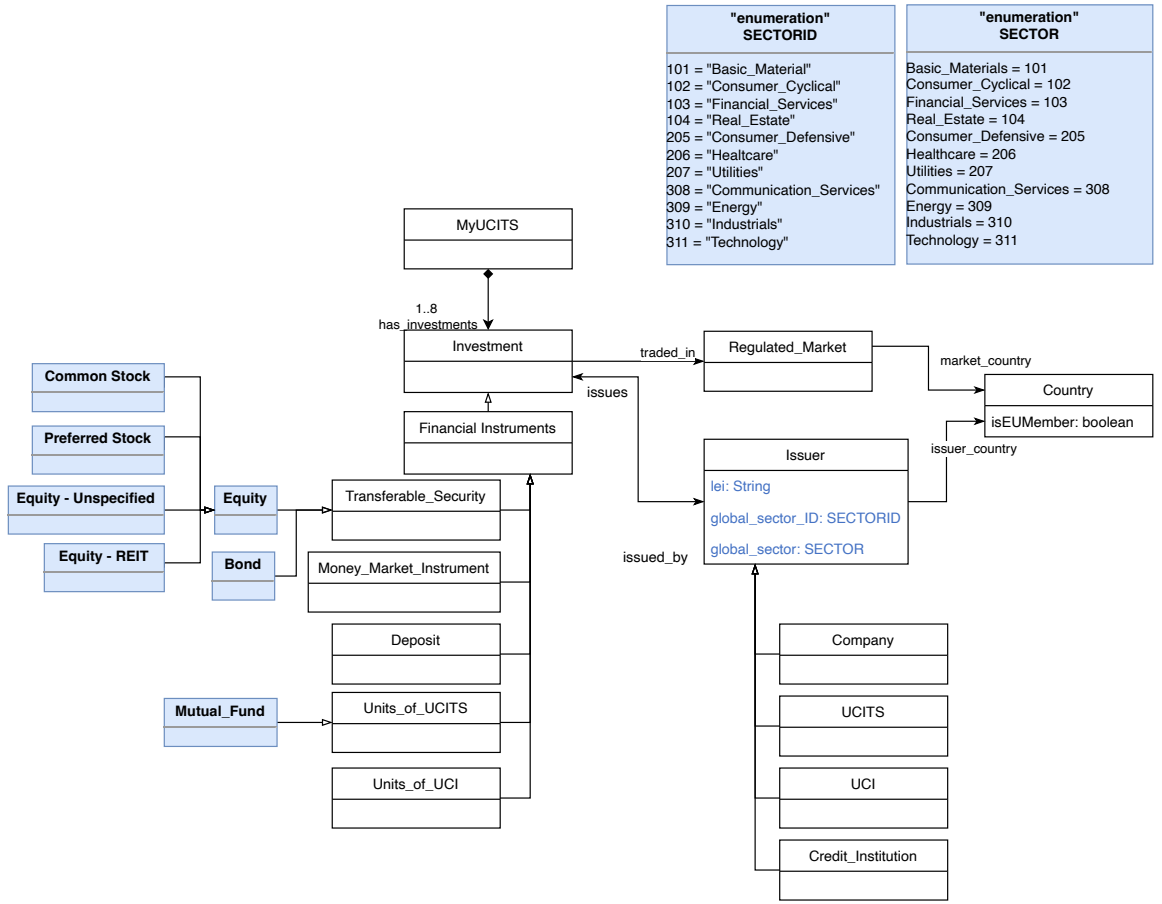


2. Eliciting Concepts from Business Data

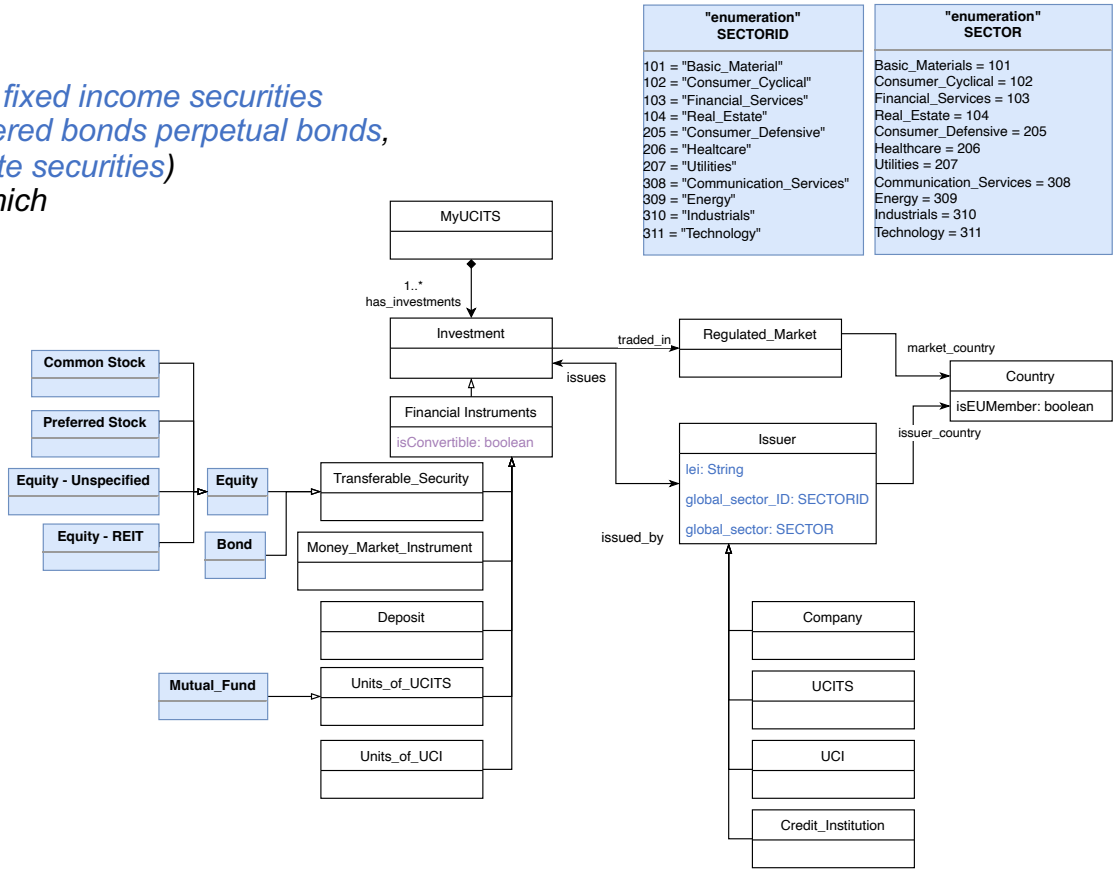
detailholdingtypeid	detailholdingtype
B	Bond - Corporate Bond
BQ	Bond - Undefined
BR	Bond - Bank Loans
BT	Bond - Gov't/Treasury
C	Cash
CH	Cash - Currency
CD	Cash - CD/Time Deposit
CL	Currency - Future
CU	Currency - Forward
DB	Bond - Option (Call)
DD	Commodity
DH	Equity - Option (Call)
E	Equity
EL	Equity Index - Future
EQ	Equity - Undefined
ER	Equity - REIT
EU	Equity - Units
EW	Equity - Warrants/Rights (Call)
EX	Mutual Fund - Unspecified
FC	Mutual Fund - Closed End
FE	Mutual Fund - ETF
FM	Mutual Fund - Money Market
FO	Mutual Fund - Open End
IT	Income Trust
P	Preferred Stock

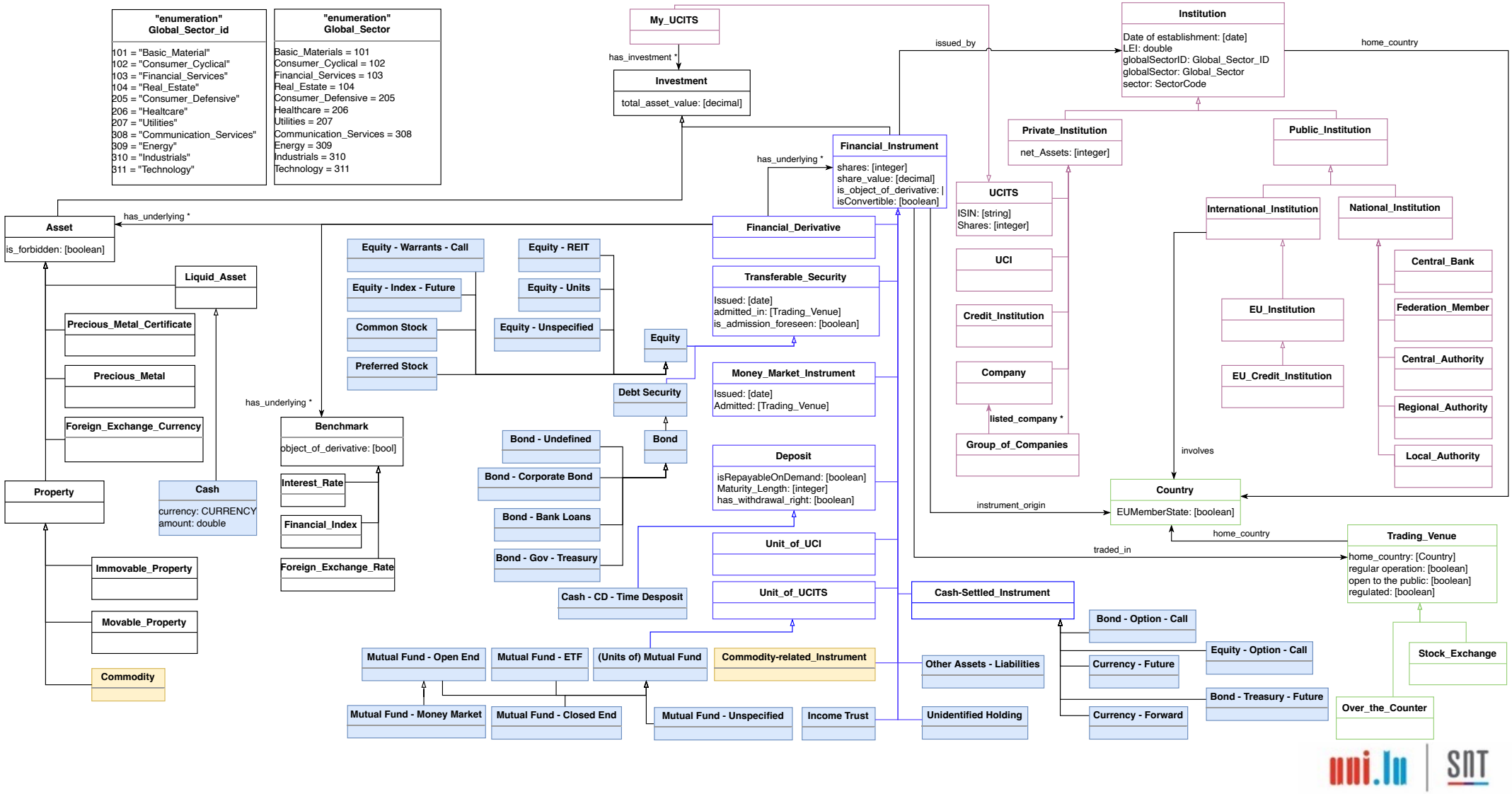
globalsectorid	globalsector
101	Basic Materials
103	Financial Services
311	Technology
102	Consumer Cyclical
206	Healthcare
310	Industrials
308	Communication Services
104	Real Estate
309	Energy
205	Consumer Defensive
207	Utilities



3. Eliciting Concepts from Fund Documents

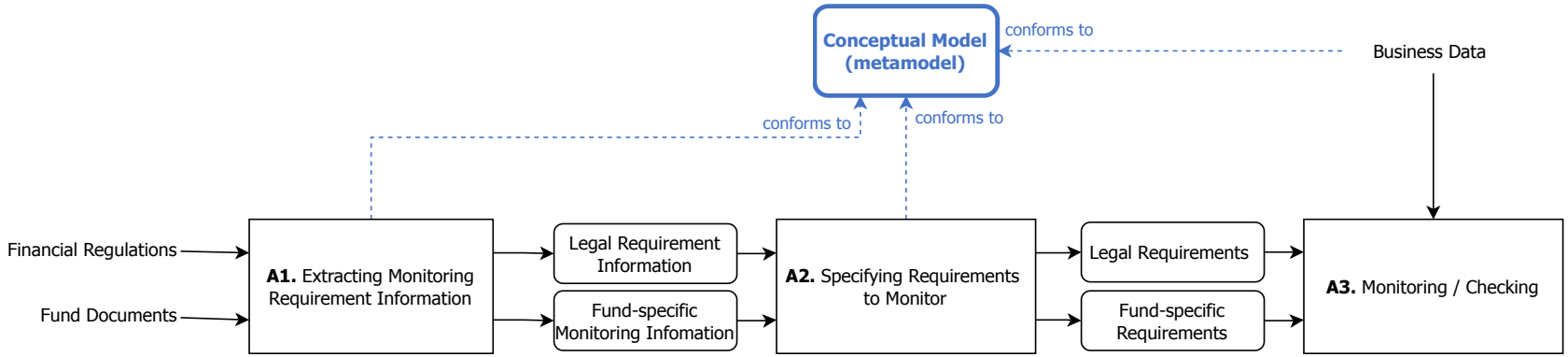
*The Sub-fund **invests at least** two-thirds of its assets in fixed income securities (including zero-coupon bonds, subordinated bonds, covered bonds perpetual bonds, and securities issued on a discount basis and floating rate securities) of corporate issuers which are domiciled in Europe or which conduct the majority of their business activities there.*




"enumeration"
Global_Sector_id
101 = "Basic_Material"
102 = "Consumer_Cyclical"
103 = "Financial_Services"
104 = "Real_Estate"
205 = "Consumer_Defensive"
206 = "Healtcare"
207 = "Utilities"
308 = "Communication_Services"
309 = "Energy"
310 = "Industrials"
311 = "Technology"
"enumeration"
Global_Sector
Basic_Materials = 101
Consumer_Cyclical = 102
Financial_Services = 103
Real_Estate = 104
Consumer_Defensive = 205
Healthcare = 206
Utilities = 207
Communication_Services = 308
Energy = 309
Industrials = 310
Technology = 311
My_UCITS
has_investment *
Investment
total_asset_value: [decimal]
issued_by
Institution
Date of establishment: [date]
LEI: double
globalSectorID: Global_Sector_ID
globalSector: Global_Sector
sector: SectorCode
home_country
Private_Institution
net_Assets: [integer]
Public_Institution
has_underlying *
Financial_Instrument
shares: [integer]
share_value: [decimal]
is_object_of_derivative: |
isConvertible: [boolean]
UCITS
ISIN: [string]
Shares: [integer]
International_Institution
National_Institution
Asset
is_forbidden: [boolean]
has_underlying *
Financial_Derivative
UCI
Central_Bank
Liquid_Asset
Equity - Warrants - Call
Equity - REIT
Transferable_Security
Issued: [date]
admitted_in: [Trading_Venue]
is_admission_foreseen: [boolean]
Credit_Institution
EU_Institution
Federation_Member
Precious_Metal_Certificate
Equity - Index - Future
Equity - Units
Company
EU_Credit_Institution
Central_Authority
Precious_Metal
Common Stock
Equity - Unspecified
Equity
Money_Market_Instrument
Issued: [date]
Admitted: [Trading_Venue]
Regional_Authority
Foreign_Exchange_Currency
Preferred Stock
Debt Security
listed_company *
Group_of_Companies
Local_Authority
has_underlying *
Benchmark
object_of_derivative: [bool]
Bond - Undefined
Bond
Deposit
isRepayableOnDemand: [boolean]
Maturity_Length: [integer]
has_withdrawal_right: [boolean]
involves
Property
Cash
currency: CURRENCY
amount: double
Interest_Rate
Bond - Corporate Bond
Country
EUMemberState: [boolean]
instrument_origin
Financial_Index
Bond - Bank Loans
Unit_of_UCI
home_country
Trading_Venue
home_country: [Country]
regular operation: [boolean]
open to the public: [boolean]
regulated: [boolean]
Immovable_Property
Foreign_Exchange_Rate
Bond - Gov - Treasury
traded_in
Movable_Property
Cash - CD - Time Desposit
Unit_of_UCITS
Cash-Settled_Instrument
Bond - Option - Call
Commodity
Mutual Fund - Open End
Mutual Fund - ETF
(Units of) Mutual Fund
Commodity-related_Instrument
Other Assets - Liabilities
Currency - Future
Equity - Option - Call
Stock_Exchange
Mutual Fund - Money Market
Mutual Fund - Closed End
Mutual Fund - Unspecified
Income Trust
Unidentified Holding
Currency - Forward
Bond - Treasury - Future
Over_the_Counter

Outlook

Insights on Work in Progress / Next Steps

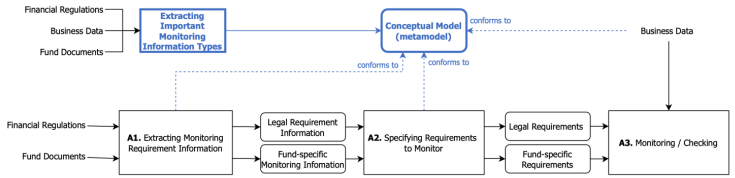


- Extracting and Specifying requirements to monitor
  - Manual one-shot effort for legal requirements, (Semi-)automated for fund-specific requirements
  - Selecting/Devising a target language for formally expressing the requirements

- Devising the concrete monitors from the requirements and performing the actual checks

Conclusion

Contribution: A Conceptual Model for Harmonizing the Landscape



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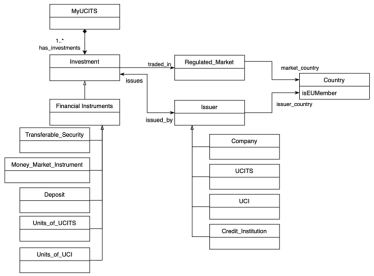
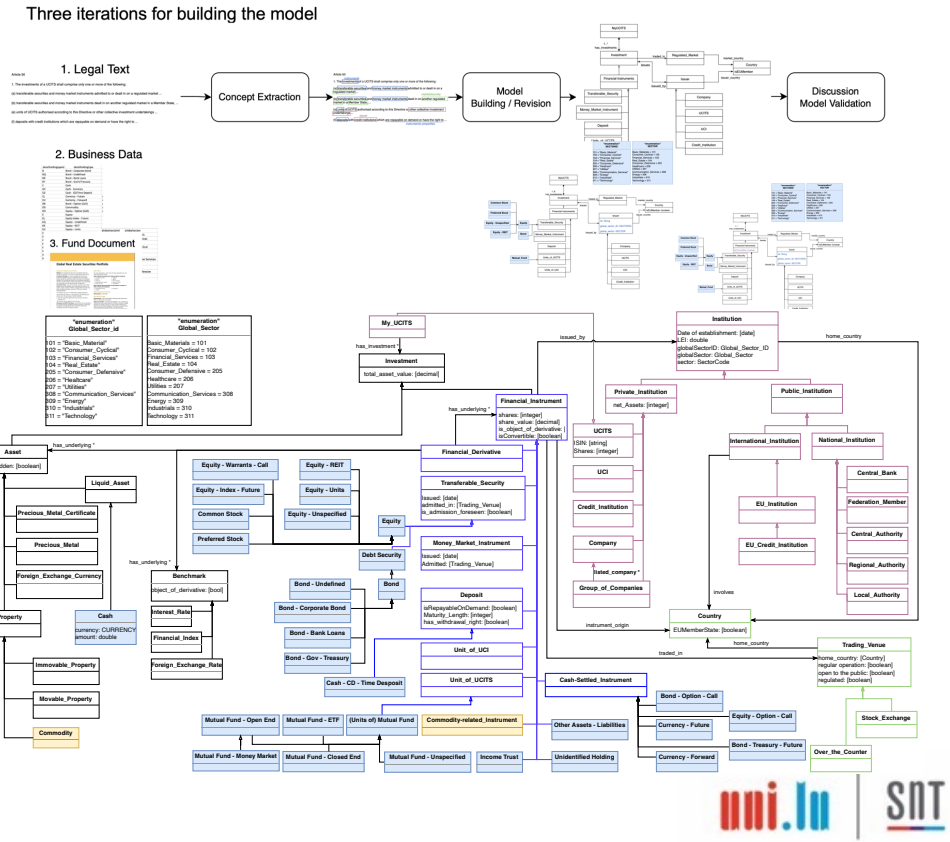


Methodology

Three iterations for building the model