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Financial Industry Business Ontology – Indices and Indicators

FTF – Beta2

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Normative:

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Preface

OMG

Founded in 1989, the Object Management Group, Inc. (OMG) is an open membership, not-for-profit computer industry standards consortium that produces and maintains computer industry specifications for interoperable, portable, and reusable enterprise applications in distributed, heterogeneous environments. Membership includes Information Technology vendors, end users, government agencies, and academia.

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Business Modeling Specifications

Middleware Specifications

- **CORBA/IIOP**
- **Data Distribution Services**
- **Specialized CORBA**

IDL/Language Mapping Specifications

Modeling and Metadata Specifications

- **UML, MOF, CWM, XMI, ODM**
- **UML Profile**

Modernization Specifications

Platform Independent Model (PIM), Platform Specific Model (PSM), Interface Specifications

- **CORBAServices**
- **CORBAFacilities**

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OMG Domain Specifications

CORBA Embedded Intelligence Specifications

CORBA Security Specifications

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`Courier`~~**`/Courier New`**~~ **`- 10 pt. Bold:`** Programming language elements.

Helvetica/Arial - 10 pt: Exceptions

NOTE: Terms that appear in italics are defined in the glossary. Italic text also represents the name of a document, specification, or other publication.

Issues

The reader is encouraged to report any technical or editing issues/problems with this specification to http://www.omg.org/report_issue.htm.

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1 Scope

This specification is a model of finance industry concepts in the subject area of market indices, interest rates, currency exchange rates and economic indicators. These have in common that they are all numeric measures (denominated variously as percentages, numbers or monetary amounts), published by some publisher or set by some public body, and providing information on the state of some economy, currency, basket of instruments or risks, formulated to reflect the behavior of some part of the global economy. These indices and indicators are widely referred to within the financial services industry, and many of them are also the subject of derivative contracts in which some part of that derivative is derived from the value of some such rate.

The types of indices and indicators included in this specification are intended to reflect the terms found in common securities and derivatives contracts and the level of detail of these is intended to reflect those details which are articulated in such contract terms. For this reason, details of the methods by which such figures are arrived at by their publishers are not included except where these serve to distinguish one such index from another. In keeping with the nature of FIBO as a series of specifications of business semantics, properties are included which capture the meaning of a concept whether or not these would be articulated in applications which may be derived from this specification – for example it is the case that certain economic indicators give a measure of the state of some economy, even though properties which assert this may not be required in some operational use case.

1.1 Overview

Issue	FIBOIND-9	The introduction to the specification reflects an out of date overview of FIBO and IND and should be updated

The Indices and Indicators (IND) Specification is part of a family of specifications called the Financial Industry Business Ontology (FIBO). FIBO is a modularized formal model of the concepts represented by finance industry terms as used in official communications such as contracts, product/service specifications and governance and regulatory compliance reporting. The scope of the finance industry encompasses a broad range of organizations that manage money, including credit unions, banks, credit card companies, insurance companies, consumer finance companies, stock brokerages, investment funds and some government sponsored enterprises. This specification defines concepts related to quoted market indices, indicators, foreign exchange rates, and interest rates, all relevant to valuation of securities, to definition of economic and other rate based derivatives, and general analysis of economies around the world.

The [FIBO Foundations] specification describes the modeling notation which has been employed and the requirements for presentation of this material to domain experts.~~This specification is part of a family of specifications called the Financial Industry Business Ontology (FIBO).~~

~~FIBO is a modularized formal model of the concepts represented by finance industry terms as used in official financial organization documents such as contracts, product/service specifications and governance and regulatory compliance documents. This is referred to as a *Business Conceptual Model* as distinct from data models in IT implementations.~~

~~The scope of *finance industry* encompasses a broad range of organizations that manage money, including credit unions, banks, credit card companies, insurance companies, consumer finance companies, stock brokerages, investment funds and some government sponsored enterprises.~~

~~The FIBO Indices and Indicators specification covers two considerations: the content of the model as a set of business concepts, and the presentation of this content for business domain expert review as described in [FIBO Foundations]. The latter requirement is important both for the use of the content as a formal business conceptual model within a technology development lifecycle, and for extension of this model content.~~

~~Extension of this model may be undertaken either by individual firms, or as part of the submission of model content for future versions of this specification.~~

~~This specification describes the content of FIBO Indices and Indicators. The [FIBO Foundations] specification describes the modeling notation which has been employed and the requirements for presentation of this material to domain experts.~~

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1.2 Scope of Financial Industry Business Ontologies: Indices and Indicators

1.2.1 How This Specification fits with the overall FIBO

Issue	FIBOIND-9	The introduction to the specification reflects an out of date overview of FIBO and IND and should be updated

This specification describes a set of ontologies of and relating to interest rates, currency exchange rates, economic indicators and market indices, within the overall framework and heading of the Financial Industry Business Ontology (FIBO). The ontology content described in this specification is developed and maintained using the same modeling framework as all FIBO ontologies. It both extends and references a subset of the ontologies specified in FIBO Foundations [FIBO Foundations]. ~~It also depends on a subset of the ontologies specified in FIBO Business Entities [FIBO BE].~~ It also depends on a subset of the ontologies specified in the FIBO Business Entities [FIBO BE] and FIBO Financial Business and Commerce [FIBO FBC] specifications.

1.2.2 Business Scope

The business scope of this specification is all terms relating to and definitive of a range of market and economic indicators that are considered by financial industry firms, regulators and other industry participants to be of relevance in the financial services domain.

The scope of the concepts in this specification is those common to

- Published rates about markets and about economic performance generally,
- Interest rates (lending rates, inter-bank rates, reference rates),
- Rates of exchange between currencies,
- Economic indicators which provide some measure of some economy (inflation rates, Gross Domestic Product, unemployment rates),
- Also in scope for FIBO-IND but not in this specification are market indices composed of simulated baskets of issued securities, credit indices based on baskets of risk-sensitive debts and so on.

These are concepts which have a temporal element, that is the value of each index and indicator has a current value, a number of past values the number of which varies according to the frequency with which that index is published, and an indefinite number of projected future values as determined by some party at some time by some means. The temporal aspects of Indices and Indicators are provided via the normative reference to [FIBO Foundations] and/or [DTV].

Many derivatives are named for the index or interest rate which is the underlying of that derivative, for example when a trader speaks of “selling the S&P500” index. It should be understood that, notwithstanding the commonality of names, there is a semantic and economic distinction between an index and a contract which gives the holder some participation in changes to that index. This specification deals only with the indices not the derivatives of those indices, which are to be provided in other FIBO specifications which will depend on the concepts here.

1.2.3 Relation to Existing Market Index and Economic Indicator Standards

Issue	FIBOIND-9	The introduction to the specification reflects an out of date overview of FIBO and IND and should be updated

~~The model defined in this specification is a “business conceptual model” as described in Section 1.2 of the [FIBO Foundations] specification. A business conceptual model in the sense used here is one which represents things in the business domain as distinct from data descriptions for data about those things, and which does not reflect the technical constraints of any given application. As such this specification is intended to be complementary to technical standards in the financial services industry, most of which were developed and are framed (positioned) either as logical data models or as physical message schemas. For this reason this specification includes concepts which contribute towards the definition~~

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~~of a concept or the disambiguation of concepts without reference to whether all of these individual properties would be used within a physical application.~~

~~To the extent that logical data model or physical message standards include content relating to indices and indicators, this specification defines the semantics of those data and message elements.~~

Standards for derivative transactions such as FpML are descriptive of derivatives including those which are derivative of indices and indicators, and are not definitive descriptions of the indices or indicators themselves. FpML does contain individual message terms which refer to these indices and indicators but these are intended to refer to these concepts in the definition of derivative instruments, they are not intended to define these concepts themselves. These message schema elements are framed at the physical level while the current specification is at the conceptual level. These FIBO models represent a computationally independent model.

The [ISO 20022] standard has a component referred to as the "Financial Industry Business Information Model" [FIBIM] which includes indices and indicators terms. Many of the terms in this specification were initially defined with reference to that specification and subsequently refined by subject matter expert reviews. As such, this specification is intended to provide the conceptual model business concepts which correspond to the more technical design models in the ISO 20022 FIBIM material.

Definitions for economic indicators defined in this specification reflect not only the financial industry standards as discussed above, but broader statistical information as published by government statistics agencies (e.g., the U.S. Bureau of Labor Statistics (BLS) and Bureau of Economic Analysis (BEA), Statistics Canada, and so forth). They also reflect glossaries and other publications by international organizations such as the International Monetary Fund (IMF), whose guidelines are used by governments for publication of such statistics. Although only a small subset of the total number of indicators published monthly, quarterly, and annually by such agencies are defined herein, the goal of this specification is to provide a top level conceptual model of an economic indicator that is representative of the majority of these kinds of indicators. Coverage of a number of the leading indicators required for use in defining economic derivatives and rate based derivatives are included, and provide a template that banks and other organizations can use to define others as needed.

1.3 Definitions

Issue	FIBOIND-9	The introduction to the specification reflects an out of date overview of FIBO and IND and should be updated

The human readable definitions associated with every concept, property, and individual defined herein have been developed following guidelines specified in ISO 704 [ISO 704] for construction of definitions, similar to typical Aristotelian styling for definition development. They have been adapted from a number of standard business and financial industry references as well as from the relevant regulations, by a team of business subject matter experts. Source materials for these definitions are referenced to the degree possible. The process by which team development of FIBO content is accomplished has evolved significantly since the original FIBO Foundations [FIBO Foundations] RFC submission, and minutes from most of the working group sessions are available from the EDM Council wiki. Contributors from a variety of IT and business backgrounds, from a number of leading institutions and related consultancies have reviewed this material internally as a part of that process. Content was also derived from the original EDM Council Semantics Repository as appropriate.~~The human readable definitions have been constructed by and with the input of business subject matter experts.~~

~~Many definitions have been derived from definitions of data elements corresponding to those terms in industry data standards and messaging standards. These have been adapted where necessary to ensure that they are descriptive of the thing itself and not of data elements for data about those things. These have been reviewed by industry subject matter experts to ensure that such adaptation accurately captures the sense of the business concept. In cases where the definition in a technical industry standard was incomplete, context-specific or tautologous, a fresh definition was framed by the industry subject matter experts who participated in these reviews. Where this was not possible, a third party definition was proposed and adopted.~~

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1.3.1. Definitions Policy

Issue	FIBOIND-9	The introduction to the specification reflects an out of date overview of FIBO and IND and should be updated

Although the starting point for many of the FIBO terms throughout the FIBO family of specifications was the ISO 20022 FIBIM model, much of the content contained herein is new, created to fill gaps with respect to statistical representation of economic indicators, better conceptual representation of quoted foreign exchange and interest rates, common interest rates used in banking on a daily basis, and so forth. The policy for sourcing definitions and adapting them follows from decisions made for other FIBO specifications, however. ~~Many definitions in this specification were initially derived from terms given in the ISO 20022 FIBIM model, with adaptations to the definitions text where necessary to re-frame the definition from that of a data element, field or table to the definition of the thing in the world to which the FIBO concept refers. The exceptions to this approach are where additional concepts were added during industry subject matter expert reviews; in these cases the definition has been arrived at through consensus of the financial industry subject matter experts participating in those reviews. The policy which follows is given for FIBO specifications in general but has not needed to be called upon for this specification.~~

Where definitions for the FIBO industry terms are derived from third party sources, rather than existing glossaries such as those published by the IMF and various statistical agencies, the policy for arriving at those definitions is as follows (and remains so for future iterations and extensions):~~Where definitions for the FIBO industry terms are derived from third party sources, the policy for arriving at those definitions is as follows (and remains so for future iterations and extensions):~~

~~1.~~ 1. In the absence of a definition endorsed by the subject matter experts for a term, Barron's Dictionary of Finance and Investment Terms, 9th Edition (John Downes and Jordan Elliot Goodman), and the related Dictionary of Banking Terms, 6th Edition (Thomas P. Fitch), and Dictionary of Business and Economics Terms, 5th Edition (Jack P. Friedman), shall be used.~~In the absence of a definition endorsed by the subject matter experts for a term, definitions will be sourced from US government sites, including the US Federal Reserve Bank of NY, and the Bureau of Labor and Statistics (BLS), as appropriate.~~

2. If a term and its acceptable definition is not contained in one of the Barron's Dictionaries, then http://www.investopedia.com/dictionary/ shall be the authoritative source, subject to licensing requirements being met.

3. If a term and its acceptable definition is not in either the Barron's Dictionaries or investopedia, then http://www.bankersalmanac.com/addcon/dictionary/ shall be the authoritative source. ~~2. When there is a conflict with the definition of a Financial Industry term with the same term in another Industry, the Financial Industry definition will be used within FIBO.~~

4. If a term has no acceptable definition in these Financial Industry sources or does not exist in these Financial Industry sources then http://www.merriam-webster.com shall be the authoritative source.

5. When there is a conflict with the definition of a Financial Industry term with the same term in another Industry, the Financial Industry definition will be used within FIBO.

In all cases the source from which the definition was obtained, or from which it was adapted, is recorded in annotation metadata for that concept.

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2 Conformance

Issue	FIBOIND-11	The conformance section of the specification reflects an out of date approach to conformance for FIBO and should be updated

~~**Audience:** Technical, semantic technology and standards audiences.~~

2.1 Applications for which Conformance Points Exist

This Clause defines conformance points for the following types of artifacts:

- Technical applications of FIBO such as logical data models, XML schemas, operational ontologies, code, and other technical artifacts
- Extensions of FIBO
- Representations of FIBO for business consumption
    - In diagrams
    - In spreadsheets and tables

Conformance of technical applications of FIBO is the most important conformance point, because it addresses the core issue of what it means to conform to the ontologies that FIBO defines.

Note that in addition to conformant applications, there are a number of scenarios in which someone may make use of the FIBO ontologies as a business conceptual model while applying their own design to meet their requirements. It is not possible to define specific conformance points for each of the possible ways in which one may legitimately develop a conventional database application or an operational OWL ontology that would be a good application.

2.2 Conformance Points

Issue	FIBOIND-11	The conformance section of the specification reflects an out of date approach to conformance for FIBO and should be updated

These consist of the generic FIBO conformance points defined in further detail in [FIBO Foundations], applied to the specific ontologies in this Specification.

This specification has the following conformance points.

~~This specification has the following conformant points for the above applications:~~

- ~~Conformant extension: as described in [FIBO Foundations] for conformant extensions to model content~~
- ~~Operational ontologies: conformance may be asserted for~~
    - ~~This entire specification (FIBO-Full conformance)~~
    - ~~Ontology conformance – subject to the ontology dependencies;~~
- ~~The content of this specification may be rendered conformant with the model presentation conformance points described under "Conformant Presentation of Model Content" in [FIBO Foundations] both for diagrams and for tabular reports.~~
- ~~Spreadsheets may assert conformance to the "tabular presentation" conformance point described under "Conformant Presentation of Model Content" in [FIBO Foundations] without reference to other material.~~

2.2.1 Conformant Technical Applications

- If a technical application is FIBO Model Conformant† with the complete set of FIBO IND ontologies, then the application satisfies *Full FIBO IND Model Conformance*.
- If a technical application is FIBO Model Conformant with a particular FIBO IND ontology, then the application satisfies *FIBO IND Ontology Conformance* for that particular ontology. There is thus a separate conformance point for each ontology in Clauses 9 and 10.

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† "FIBO Model Conformant" is defined in [FIBO Foundations].

2.2.2 Conformant Extensions

- If an ontology is FIBO Extension Conformant† for an ontology in IND, and FIBO ODM Conformant†, then it satisfies *FIBO IND Extension in ODM* for that ontology. If this holds for all the ontologies in IND then it satisfies *FIBO IND-Full Extension in ODM*

- If an ontology is FIBO Extension Conformant† for an ontology in IND, and FIBO OWL Conformant† then it satisfies *FIBO IND Extension in OWL* for that ontology. If this holds for all the ontologies in IND then it satisfies *FIBO IND-Full Extension in OWL*

† "FIBO Extension Conformant", "FIBO ODM Conformant" and "FIBO OWL Conformant" are defined in [FIBO Foundations].

2.2.3 Conformant Presentation

A rendering of the ontologies in clauses 9 and 10 of this IND specification is:

- *FIBO IND Business Diagram Conformant* if it provides coverage of all the ontologies and is FIBO Business Diagram Conformant†

- *FIBO IND Business Table Conformant* if it provides coverage of all the ontologies and is FIBO Business Table Conformant†

† "FIBO Business Diagram Conformant" and "FIBO Business Table Conformant" are defined in [FIBO Foundations].

2.3 Operational Ontology Conformance

An OWL ontology derived from this specification (known as an "operational ontology") is conformant to this specification if:

- It uses individual ontologies in this specification along with imports of any ontologies that are shown as imported by the ontologies in this specification; or

- It uses some sub-set of the terms contained in individual ontologies in this specification, along with imports of any ontologies that are shown as imported by the ontologies in this specification and the terms which are used in the ontology make reference to the terms which are in the imported ontologies; there is no need to import ontologies which contain only terms which are not referred to by the terms that are used in the ontology which asserts such conformance.

When asserting conformance in terms of this conformance point, the operational ontology should identify and name to which of the individual ontologies in this specification the application is conformant.

For detailed descriptions of the above conformance points and others, please refer to [FIBO Foundations].

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3 References

3.1 Normative References

Issue	FIBOIND-13	The normative references section of the specification is out of date and should be updated

The following normative documents contain provisions which, through reference in this text, constitute provisions of this specification. For dated references, subsequent amendments to, or revisions of, any of these publications do not apply.

Reference	Description
[Dublin Core]	DCMI Metadata Terms, Issued 2013-06-14 by the Dublin Core Metadata Initiative. Available at http://www.dublincore.org/documents/dcmi-terms/.
[DTV]	The OMG Date Time Vocabulary. Available at http://www.omg.org/spec/DTV/.~~The OMG Date Time Vocabulary version 1.1. Anticipated Summer 2014 at http://www.omg.org/spec/DTV/1.1/~~
[FIBO BE]	Financial Industry Business Ontology (FIBO) – Business Entities (EDMC-FIBO/BE). Available at http://www.omg.org/spec/EDMC-FIBO/BE/
[FIBO Foundations]	Financial Industry Business Ontology (FIBO) – Foundations (EDMC-FIBO/FND). Available at http://www.omg.org/spec/EDMC-FIBO/FND/
[ISO 704]	ISO 704:2000 Terminology Work – Principles and Methods
[ISO 1087]	ISO 1087-1:2000 Terminology — Vocabulary — Part 1: Theory and application
[MOF Core]	Meta Object Facility (MOF™) Core, ~~v2.4.2~~v2.5. Available at http://www.omg.org/spec/MOF/2.5~~4.2~~/.
[MOF XMI]	MOF 2/XMI (XML Metadata Interchange) Mapping Specification, ~~v2.4.2~~v2.5. Available at http://www.omg.org/spec/XMI/2.5~~4.2~~/.
[ODM 1.1]	Ontology Definition Metamodel (ODM), v1.1. Available at http://www.omg.org/spec/ODM/1.1/.
[OMG AB Specification Metadata]	OMG Architecture Board recommendations for specification of ontology metadata, Available at http://www.omg.org/techprocess/ab/SpecificationMetadata.rdf~~http://www.omg.org/techprocess/ab/20130701/SpecificationMetadata.rdf~~
[OWL 2]	OWL 2 Web Ontology Language Quick Reference Guide (Second Edition), W3C Recommendation 11 December 2012. Available at http://www.w3.org/TR/2012/REC-owl2-quick-reference-20121211/.
[RDF 1.1]	RDF 1.1 Concepts and Abstract Syntax. Richard Cyganiak, David Wood and Markus Lanthaler, Editors. W3C Recommendation, 25 February 2014. Latest version is available at http://www.w3.org/TR/rdf11-concepts/.~~RDF 1.1 Concepts and Abstract Syntax, W3C Proposed recommendation available at http://www.w3.org/TR/2013/WD-rdf11-concepts-20130723/~~
~~**[RDF Concepts]**~~	~~Resource Description Framework (RDF): Concepts and Abstract Syntax. Graham Klyne and Jeremy J. Carroll, Editors. W3C Recommendation, 10 February 2004. Latest version is available at http://www.w3.org/TR/rdf-concepts/.~~
[RDF Schema]	RDF Schema 1.1. Dan Brickley and R.V. Guha, Editors. W3C Recommendation, 25 February 2014. Latest version is available at http:// www.w3.org/TR/rdf-schema/.~~RDF Vocabulary Description Language 1.0: RDF Schema. Dan Brickley and R.V. Guha, Editors. W3C Recommendation, 10 February 2004. Latest version is available at http:// www.w3.org/TR/rdf-schema/.~~
[SKOS]	SKOS Simple Knowledge Organization System Reference, W3C Recommendation 18 August 2009. Available at http://www.w3.org/TR/2009/REC-skos-reference-20090818/.
[UML2]	Unified Modeling Language™ (UML®), version 2.5. Available at http://www.omg.org/spec/UML/2.5/.~~Unified Modeling Language™ (UML®), version 2.4.1. Available at http://www.omg.org/spec/UML/2.4.1/~~.
[Unicode]	*The Unicode Standard, Version 3*, The Unicode Consortium, Addison-Wesley, 2000. ISBN 0-201-61633-5, as updated from time to time by the publication of new versions. (See http:// www.unicode.org/unicode/standard/versions/ for the latest version and additional information on versions of the standard and of the Unicode Character Database).
[UTF-8]	RFC 3629: UTF-8, a transformation format of ISO 10646. F. Yergeau. IETF, November 2003,

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	http://www.ietf.org/rfc/rfc3629.txt
[W3C Datatypes in RDF and OWL]	XML Schema Datatypes in RDF and OWL, W3C Working Group Note 14 March 2006, Available at http://www.w3.org/TR/2006/NOTE-swbp-xsch-datatypes-20060314/.
[XML Schema Datatypes]	XML Schema Part 2: Datatypes. W3C Recommendation 28 October 2004. Latest version is available at http://www.w3.org/TR/xmlschema-2/.

3.2 Non Normative References

The following informative documents are referenced throughout this text or in parts of the Annexes:

Reference	Description
[ISO 20022]	ISO 20022 Financial Services - Universal financial industry message scheme, available at www.iso20022.org
[OMV]	Ontology Metadata Vocabulary (OMV) - http://omv2.sourceforge.net/ (a standard giving metadata for ontology-level information)
[FIBIM]	ISO TC68/SC4/WG11 Document N012 version 3

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4 Terms and Definitions

For the purposes of this specification, the following terms and definitions apply.

Content

Definition: Subject matter

Business conceptual model

Definition: A model which represents and only represents business subject matter without reference to the design of any solution or data model representation.

Ontology

Definition: A formalization of a conceptualization. For the purposes of this specification the formalization is in OWL, using ODM as a means to render this, and the conceptualization is that of business subject matter.

Operational Ontology

Definition: An ontology which is intended for use within some application.

Subject matter

Definition: Information about things in the universe of discourse; the essential facts, data, or ideas that constitute the basis of spoken, written, or artistic expression or representation; often : the substance as distinguished from the form especially of an artistic or literary production.

Taxonomy

Definition: A set of terms which stand in some classification relation to one another.

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5 Symbols and Abbreviations

5.1 Symbols

There are no symbols introduced by this specification.

5.2 Abbreviations

The following abbreviations are used throughout this specification:

- OWL – Web Ontology Language
- ODM – Ontology Definition Metamodel
- RDF – Resource Definition Framework
- SME – Subject Matter Expert
- UML – Unified Modeling Language
- URI – Uniform Resource Identifier
- URL – Uniform Resource Locator
- XMI – XML Metadata Interchange
- XML – eXtensible Markup Language

Additional symbols and abbreviations that are used only in annexes to this specification are given in those annexes.

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6 Additional Information

Issue FIBOIND-15 Section 6, Additional Information, is obsolete

6.1 ~~How to Read this Specification~~Audience

This specification has the following audiences:

- The standards community
- The finance industry business and regulatory community
- Information Technology (IT) architects
- Taxonomists and Ontologists

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6.1.1 ~~Audience~~Standards Community

This audience is intended to be able to follow and validate the way in which this specification documents the models (ontologies) defined herein.

~~This specification has the following audiences:~~

- ~~The standards community~~
- ~~The finance industry business community~~
- ~~The regulatory community~~
- ~~Technical architects~~
- ~~Semantic Modelers~~

~~6.1.1.1 Standards Community~~

~~This audience is intended to be able to follow and validate the way in which this specification sets out the arrangements for the production and maintenance of model content, and the production of business-facing reports and diagrams representing parts of that content.~~

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~~6.1.2~~6.1.2 ~~The~~ Finance Industry Business Community

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As noted in the section on conformance (Clause 2) this specification defines concepts, relationships among those concepts, logical sentences that refine the meaning of those concepts, and well-known individuals (such as for specific regulatory agencies, central banks, and registries) that instantiate those concepts for use by business subject matter experts. There may be technical details in some of the diagrams, as well as logic expressions in tables that are not targeted at this audience, but the concepts and annotations, including definitions, examples, explanatory notes, and so on, in the tables accompanying the diagrams should be consumable and relevant for this audience.

~~As noted in the section on conformance (section 2) this specification includes detailed requirements for the production of diagrams and reports which are intended for consumption by business subject matter experts. This specification also contains material addressed at this audience, this being an informative annex on "Interpreting Model Content". This audience is not intended to read and understand the remaining parts of this specification.~~

~~6.1.1.3 The Regulatory Community~~

~~As for Finance Industry Business Community.~~

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~~6.1.4~~6.1.3 Information Technology (IT) Architects, Enterprise Architects, and Developers~~Technical Architects~~

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These include but are not limited to:

- ~~Tooling vendors and developers~~
- Tool vendors and developers
- ~~Other content providers / enriched content providers~~ Application and content providers / enriched content providers
  - ~~o~~
- Business Analysts – including business analysts in the banking community, business architects, process engineers, metadata and data governance experts, and so forth
- ~~Business Analysts – anyone who uses the model whether they are a modeler, a metadata analyst, etc.~~
- IT and technical management
- ~~Technology Management~~

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The bulk of the "Architecture" section is intended to be read and understood by these audiences and by the 'Taxonomists and Ontologists' audience.
~~The bulk of the "Architecture" section is intended to be read and understood by these audiences and by the 'Semantic Modelers' audience.~~

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~~6.1.1.5~~6.1.4 Taxonomists and Ontologists~~Semantic Modelers~~

Much of the material in this specification is intended to be read and understood by those responsible for developing taxonomies and ontologies for the business. Such individuals must be familiar with first order logic, description logics, and the W3C family of specifications for the RDF [RDF Concepts] and OWL [OWL 2] languages. They should also be familiar with the Ontology Definition Metamodel [ODM] representation of these languages. The entire specification, including the details relevant to conformance (Clause 2), the architecture and overall approach (Clause 8), and especially the content of the ontologies (Clause 9), is important for this audience.~~Much of the material in this specification is intended to be read and understood by semantic modelers. This includes the 'Conformance' chapter (Chapter 2) and the 'Architecture' chapter (Chapter 8).~~

6.2 Acknowledgements

The following organization submitted this specification:

- Enterprise Data Management Council

The following companies have provided significant expertise and resources in the development of its content and architecture:

- 88 Solutions
- Adaptive Inc.
- Bloomberg LP
- ~~Australia and New Zealand Banking Group~~
- Bureau of Economic Analysis (BEA)
- ~~Bureau of Labor Statistics (BLS)AVOX/DTCC~~
- ~~Bank of America~~
- ~~Barclays Capital~~
- ~~BBH~~
- ~~Bloomberg~~
- ~~Business Semantics~~
- ~~CIBC~~

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- Citigroup Inc.
- Credit Suisse Group AG
- ~~CUSIP~~
- Deutsche Bank
- Federal Reserve Board (FRB)
- Global LEI Foundation / Tahoe Blue Ltd
- ~~The Federal National Mortgage Association (Fannie Mae)~~
- ~~David Frankel Consulting~~
- ~~FacetApp~~
- ~~Fidelity~~
- ~~GoldenSource Corporation~~
- Hewlett Packard Enterprise / Mphasis
- ~~HSBC Holdings plc~~
- ~~JPMorgan Chase & Co.~~
- ~~The Manufacturers Life Insurance Company~~
- ~~Michigan State University~~
- ~~Model Driven Solutions~~
- ~~Model Systems~~
- ~~Morgan Stanley~~
- ~~MphasiS~~
- ~~National Australia Bank~~
- No Magic
- ~~Nomos Software~~
- Nordea Bank AB
- ~~Oakland University~~
- ~~OntoAge~~
- ~~OpenFinance~~
- ~~PricewaterhouseCoopers LLP~~
- ~~Revelytix~~
- ~~Sallie Mae~~
- ~~SAP~~
- ~~Semantic Arts~~
- State Street
- Statistics Canada
- ~~Sungard~~
- ~~SWIFT~~
- ~~Tahoe Blue~~

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- Thematix Partners LLC
- Working Ontologist
- ~~Thomson Reuters~~
- ~~UBS AG~~
- ~~University of British Columbia~~
- University College Cork
- ~~Wells Fargo~~
- ~~Wizdom Systems, Inc.~~

6.3 Notation

The diagrams included herein are ODM-compliant UML diagrams, in other words, they conform to the UML Profiles for RDF and OWL specified in the OMG's Ontology Definition Metamodel [ODM] Specification. This includes the set of UML stereotypes and graphical notation used in the diagrams provided.

The color scheme employed in these diagrams includes:

- Basic OWL Classes: white for classes defined within the current (local) ontology, amber for classes defined within an imported (referenced) ontology
- OWL Restriction Classes and other Class Expressions (unions, intersection, complements): green
- OWL Object Properties: blue
- OWL Data Properties: dark gray
- OWL Datatypes: pink
- OWL Individuals: light gray

Within the context of this specification (and the FIBO specifications on which it depends), a module is group of ontologies, organized as a subdomain with respect to the IND namespace and as a folder from a file management perspective. One or more ontologies are contained in each of the modules in this specification, which include Economic Indicators, Foreign Exchange, Indicators, and Interest Rates. For each module there is an "about" file, which provides metadata about the module, specified in tabular form. Each of the primary ontologies in a given module is defined as an ODM-compliant UML model as well as in OWL (aside from the "about" file, which is expressed in RDF/XML only). The normative ontology is expressed in ODM XMI (*i.e.*, XMI that conforms to the ODM metamodels for RDF and OWL), ODM UML XMI (*i.e.*, that conforms to the UML Profiles for RDF and OWL in the ODM specification), and in RDF/XML serialized OWL 2.

The notation used to represent description logic expressions (*i.e.*, the expressions in the Parent columns in class tables containing ontology details) is consistent with the notation defined in the Description Logic Handbook [DL Handbook]. Some of the basics are described in Table 6-1, below. Note that this is not intended to be comprehensive, but includes the primary patterns that are used in the FIBO IND specification, for property restrictions in particular.

Table 6-1 Description Logic Expressions Notation

Construct	Description	Notation
Boolean Connectives and Enumeration		
intersection	The intersection of two classes consists of exactly those individuals which are instances of both classes.	$C \cap D$
union	The union of two classes contains every individual which is contained in at least one of these classes.	$C \cup D$

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enumeration	An enumeration defines a class by enumerating all its instances.	oneOf (i_1, i_2, i_3, … i_n)
Property Restrictions		
universal quantification	Universal quantification is used to describe a class of individuals for which all related individuals must be instances of a given class (*i.e.*, allValuesFrom in OWL).	∀R.C, where R is the relation (property) and C is the class that constrains all values for related individuals
existential quantification	Existential quantification is used to define a class as the set of all individuals that are connected via a particular property to at least one individual which is an instance of a certain class (*i.e.*, someValuesFrom in OWL).	∃R.C, where R is the relation (property) and C is the class that constrains some values of related individuals
individual value	Individual value restrictions are used to describe classes of individuals that are related to one particular individual (*i.e.*, hasValue in OWL).	∀R.I, where R is the relation (property) and I is the individual
exact cardinality	Cardinality (number) restrictions define classes by restricting the cardinality on the sets of fillers for roles (relationships, or properties in OWL). Exact cardinality restrictions restrict the cardinality of possible fillers to exactly the number specified.	= n R (for unqualified restrictions) = n R.C (for qualified restrictions, i.e., including onClass or on DataRange)
maximum cardinality	Maximum cardinality restrictions restrict the cardinality of possible fillers to at most the number specified (inclusive).	≤ n R (for unqualified restrictions) ≤ n R.C (for qualified restrictions)
minimum cardinality	Minimum cardinality restrictions restrict the cardinality of possible fillers to at least the number specified (inclusive).	≥ n R (for unqualified restrictions) ≥ n R.C (for qualified restrictions)
Class Axioms		
equivalent classes	Two classes are considered equivalent if they contain exactly the same individuals.	≡ C
disjoint classes	Disjointness means that membership in one class specifically excludes membership in another.	¬ C

Within the tabular representation for restrictions in the tables included herein, the identifiers for the restrictions shown in the diagrams are included parenthetically following the logic expressions. These are not part of the logic, but are included for comparison purposes. The identifiers are named based on the precedent set in the FIBO Foundations [FIBO Foundations] specification, which includes the namespace prefix for the ontology followed by a unique number.

Additionally, some restrictions are nested, whereby the content of an embedded (nested) restriction is also included parenthetically. In these cases, all of the identifiers will be included, also parenthetically, following the complete specification of the complex restriction. Note too that in the case of complex restrictions, where there are nested elements in parentheses, the "dot notation" used as a separator between a property and the role filler is replaced with the embedded parenthetical filler definition. A "role" from a description logic perspective is essentially a property in OWL, and the role "filler" is the class or individual that provides the value for that role in a given axiom (*i.e.* in a restriction or other logic expression).

For the vast majority of the property restrictions specified in FIBO, the restrictions are defined as necessary conditions for class membership, rather than sufficient conditions. As a result, the tables assume that necessary conditions is the default and only in cases where a restriction imposes sufficient conditions will that be stated.

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7 Introduction

Issue	FIBOIND-17	Section 7, Introduction, contains redundant information

~~7.1 Audiences~~

~~Readers are encouraged to read Section 6.1 on the different intended audiences for this specification.~~

~~7.1.1 Audience for this Section~~

~~The audience for this section is anyone who wishes to understand this standard, whether from a business or a technical standpoint.~~

~~7.1.2 Reading this Standard~~

~~Technical audiences (in both conventional and semantic technology) are directed at the "Architecture" section (Section 8).~~

~~Business audiences (financial industry participants, regulators and others) are directed at this Introduction and at Annex A on interpreting model content (Annex B).~~

~~The business content defined in this standard is intended to be presented both in a business-facing format and in a complete, technical format. The latter is intended for consumption by technical and standards audiences only. This specification defines the content of the standard and the ways in which it is to be presented to business readers.~~

~~7.2~~7.1 Specification Overview

7.~~2~~1.1 Non-~~-~~Technical Overview

~~**Audience:** Business.~~

This specification provides a model of financial market indices and economic indicators terms, definitions and relationships. The model contains no technical design content and is a representation of the indices and indicators concepts. This specification describes the technical arrangements by which this has been brought about, the requirements to be placed upon semantic modelers who are to extend this content locally or who propose updates to the model, and the requirements by which the content of this and future extensions are to be presented to business domain participants, so that they may understand and review the model content without the need for any formal technical training.

7.~~2~~1.2 Technical Overview

~~**Audience:** Technical architects.~~

The model content is developed and maintained using the Unified Modeling Language as a modeling tool framework, but with all model content built using the formal constructs of the Web Ontology Language (OWL). This is achieved using the OMG's Ontology Definition Metamodel (ODM) specification.

The use of the ODM specification in this specification is limited to a specific sub-set of OWL constructs, and is also limited to the range of UML base classes that is allowed for each of the OWL constructs that are used, as defined in the [FIBO Foundations] specification.

The model content is made available as serialized ODM UML in the form of XMI files ("ODM XMI"); as serialized UML in the form of XMI files ("UML XMI") and as OWL files in the RDF/XML syntax. The deliverables are described in Annex A.

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7.~~3~~2 Business Usage Scenarios

7.~~3~~2.1 Indices and Indicators Usage Scenarios

A number of business scenarios are supported by this specification. These include:

- Formal definitions and concepts for market indices, interest rates and economic indicators for reference in integration of systems and data feeds and for model driven development of applications which refer to these concepts;
- Index and indicator terms for the definition of derivatives contracts as types of underlying variable;
- Index, interest rate and indicator terms for the definition of variable interest or variable amortization payments in negotiable securities (principally debt securities) and in loans;
- Development of semantic models (ontologies) of derivatives and securities contracts which have indices, indicators or interest rates as their underlying variables – ontologies for those contracts whether developed privately or as future FIBO specifications, would semantically import the concepts in this specification.
- Risk applications including credit risk, market risk.

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8 Architecture

Issue	FIBOIND-26	Clause 8, Architecture is significantly out of date

~~**Intended Audiences:** Technologists, Semantic Technologists, Standards Implementers.~~

8.1 Overview

The overarching approach to a modular ontology architecture is provided in the FIBO Foundations [FIBO Foundations] Specification. The Indices and Indicators (IND) Specification leverages that modular approach and architecture. It extends the Foundations (FND), Business Entities (BE), and Financial Business and Commerce (FBC) specifications with several additional modules: (1) Economic Indicators, (2) Foreign Exchange, (3) Indicators, which provides the most abstract concept definitions for this specification, and (4) Interest Rates.

~~The architecture of FIBO is described in the [FIBO Foundations] specification.~~

~~Please also refer to the Scope section (Section 1) and the Definitions (Section 4) for detailed treatment of the terms and concepts referred to.~~

8.2 Dependencies on Other FIBO Specifications~~The Foundations Models~~

As mentioned above, IND extends concepts defined in the FIBO Foundations (FND), Business Entities (BE), and Financial Business and Commerce (FBC) specifications. The FND ontologies include definitions for contracts, business concepts such as products and service provision, general concepts such as classification schemes, identification schemes, dates and times, quantities and units, and so forth on which IND depends. IND also draws extensively on concepts defining legal, functional, and government entities from the BE specification to describe indicators publishers, and on FBC for additional material that spans multiple financial domains, such as definitions for baskets, refinement on functional entities, and so forth.~~This specification makes reference to specific sets of concepts in the [FIBO Foundations] specification.~~

~~As a consequence of the modeling principles, the model requires ontologies of things which are not specific to indices and indicators. The Foundations ontologies include legal concepts like contracts, business concepts such as service provision, as well as an extensive set of concepts for times, dates, mathematical constructs, events and activities, and so on. FIBO Indices and Indicators draws extensively on abstractions for numeric measures as well as concepts in the area of business entities drawn from the [FIBO BE] Business Entities specification, to describe publishers of indicators, interest rates and economic indicators.~~

~~Models of these concepts are maintained as described in the [FIBO Foundations] specification and the [FIBO Business Entities] specification.~~

8.3 “About” IND Vocabularies

The "about" files for IND (and for all FIBO specifications) provide metadata describing the IND specification itself and each of the modules, complementing the content in this specification and in some cases duplicating it in the form of RDF/XML metadata. These files are designed to (1) describe the machine-readable content of the specification for people who download that content directly, via content negotiations, and import it into tools that can interpret and display those files, (2) for potential use in tagging the specification document on the OMG site, and (3) to provide a high-level ontology in the case of AboutIND-1.0.rdf that imports all of the others, including all of FND, BE, and FBC, to support ease of use.

8.~~3~~4 Namespace Definitions~~Ontology Architecture and Namespaces~~

The namespaces and prefixes corresponding to external elements required for use in IND include all of those listed in the FIBO Foundations (FND), Business Entities (BE), and Financial Business and Commerce (FBC) specifications. Those namespaces and prefixes required for use of these three specifications are not repeated herein but are included by

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reference and are normative. Table 8.1 lists the prefixes and namespaces on which IND depends that are external to FIBO. Table 8.2 provides those specific to the IND specification that are also considered normative, and their usage is required in any conformant extension. As described in the [FIBO Foundations] specification in section 8.2, the ontology architecture for FIBO is designed to facilitate reuse and ontology evolution to the degree possible. An important goal of this specification is to provide the foundational terminology, including basic terminology describing amounts and rates, which provides high-level, abstract conceptual knowledge intended to facilitate mapping. The basic building blocks for the Indices and Indicators (IND) Ontology, building on the architecture provided in [FIBO Foundations], are shown in Figure 8.1, below.

As shown in the diagram, the IND ontologies are divided up into a number of *modules*. These include: indicators (concepts common to more than one type of index, rate or indicator), foreign exchange rates, interest rates and economic indicators.

The IND modules will ultimately depend on (1) Basic Terminology and Ontology Metadata (in light gray in the figure), (2) Foundations, (3) Business Entities and (4) a number of external modules, representing concepts for Natural Language, Geopolitical Entities (for example ISO 3166 Country codes, regional and municipal designations), and concepts defining dates, times, and durations. A sample set of these anticipated external resources are given in the dark gray layer in the figure.

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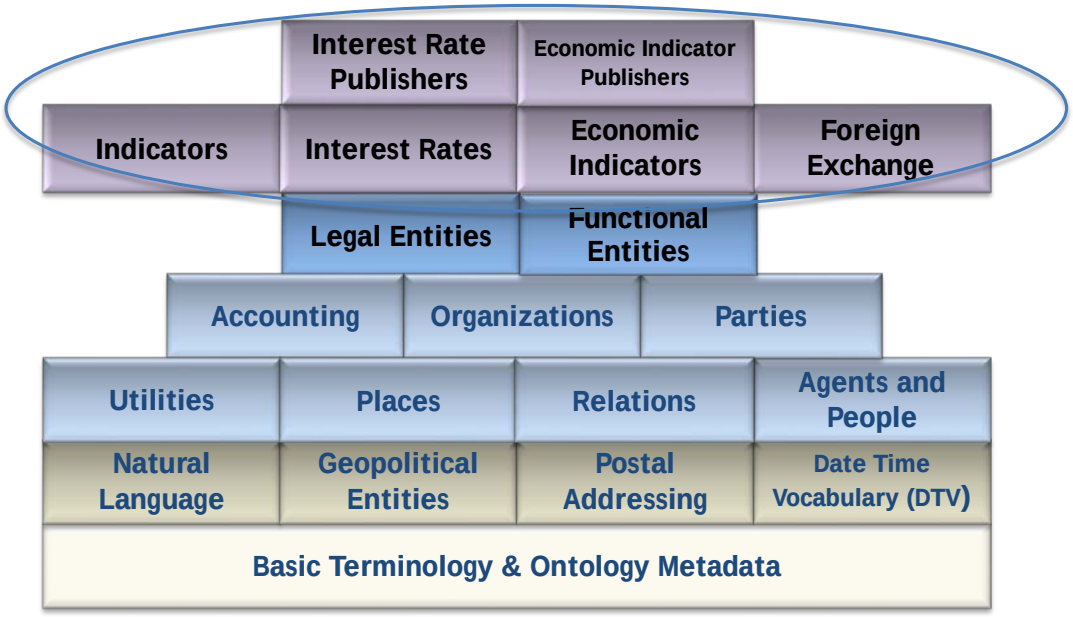

Figure 8.1 Indices and Indicators Ontology Architecture

The namespaces and their well-known prefixes corresponding to external elements required for use of FIBO Indices and Indicators include all of those listed in the FIBO Foundations specification and selected concepts from the FIBO Business Entities specification, as well as those required for the use of Foundations itself. Table 8.1 lists those prefixes and namespaces considered external to Foundations. Table 8.2 provides those required for use of Foundations while Table 8.3 provides those required for use of the Business Entities specification (repeated here for convenience).

Table 8.1 Prefix and Namespaces for referenced/external vocabularies

Namespace Prefix	Namespace
rdf	http://www.w3.org/1999/02/22-rdf-syntax-ns#
rdfs	http://www.w3.org/2000/01/rdf-schema#
owl	http://www.w3.org/2002/07/owl#
xsd	http://www.w3.org/2001/XMLSchema#
dct	http://purl.org/dc/terms/
skos	http://www.w3.org/2004/02/skos/core#
sm	http://www.omg.org/techprocess/ab/SpecificationMetadata/
lcc-lr	http://www.omg.org/spec/LCC/Languages/LanguageRepresentation/
lcc-639-1	http://www.omg.org/spec/LCC/Languages/ISO639-1-LanguageCodes/
lcc-cr	http://www.omg.org/spec/LCC/Countries/CountryRepresentation/

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lcc-3166-1	http://www.omg.org/spec/LCC/Countries/ISO3166-1-CountryCodes/
lcc-3166-2	http://www.omg.org/spec/LCC/Countries/ISO3166-2-SubdivisionCodes/

Table 8.2 Prefix and Namespaces for FIBO Foundations

Namespace Prefix	Namespace
fibo-fnd-acc-aeq	http://www.omg.org/spec/EDMC-FIBO/FND/Accounting/AccountingEquity/
fibo-fnd-acc-cur	http://www.omg.org/spec/EDMC-FIBO/FND/Accounting/CurrencyAmount/
fibo-fnd-aap-agt	http://www.omg.org/spec/EDMC-FIBO/FND/AgentsAndPeople/Agents/
fibo-fnd-aap-ppl	http://www.omg.org/spec/EDMC-FIBO/FND/AgentsAndPeople/People/
fibo-fnd-agr-agr	http://www.omg.org/spec/EDMC-FIBO/FND/Agreements/Agreements/
fibo-fnd-agr-ctr	http://www.omg.org/spec/EDMC-FIBO/FND/Agreements/Contracts/
fibo-fnd-arr-arr	http://www.omg.org/spec/EDMC-FIBO/FND/Arrangements/Arrangements/
fibo-fnd-arr-cd	http://www.omg.org/spec/EDMC-FIBO/FND/Arrangements/Codes/
fibo-fnd-arr-doc	http://www.omg.org/spec/EDMC-FIBO/FND/Arrangements/Documents/
fibo-fnd-arr-id	http://www.omg.org/spec/EDMC-FIBO/FND/Arrangements/IdentifiersAndIndices
fibo-fnd-dt-fd	http://www.omg.org/spec/EDMC-FIBO/FND/DatesAndTimes/FinancialDates/
fibo-fnd-dt-oc	http://www.omg.org/spec/EDMC-FIBO/FND/DatesAndTimes/Occurrences/
fibo-fnd-dt-bd	http://www.omg.org/spec/EDMC-FIBO/FND/DatesAndTimes/BusinessDates/
fibo-fnd-gao-gl	http://www.omg.org/spec/EDMC-FIBO/FND/GoalsAndObjectives/Goals/
fibo-fnd-gao-obj	http://www.omg.org/spec/EDMC-FIBO/FND/GoalsAndObjectives/Objectives/
fibo-fnd-law-jur	http://www.omg.org/spec/EDMC-FIBO/FND/Law/Jurisdiction/
fibo-fnd-law-lcap	http://www.omg.org/spec/EDMC-FIBO/FND/Law/LegalCapacity/
fibo-fnd-law-cor	http://www.omg.org/spec/EDMC-FIBO/FND/Law/LegalCore/

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Namespace Prefix	Namespace
fibo-fnd-org-fm	http://www.omg.org/spec/EDMC-FIBO/FND/Organizations/FormalOrganizations/
fibo-fnd-org-lg	http://www.omg.org/spec/EDMC-FIBO/FND/Organizations/LegitimateOrganizations/
fibo-fnd-org-org	http://www.omg.org/spec/EDMC-FIBO/FND/Organizations/Organizations/
fibo-fnd-oac-ctl	http://www.omg.org/spec/EDMC-FIBO/FND/OwnershipAndControl/Control/
fibo-fnd-oac-own	http://www.omg.org/spec/EDMC-FIBO/FND/OwnershipAndControl/Ownership/
fibo-fnd-oac-oac	http://www.omg.org/spec/EDMC-FIBO/FND/OwnershipAndControl/OwnershipAndControl/
fibo-fnd-pty-pty	http://www.omg.org/spec/EDMC-FIBO/FND/Parties/Parties/
fibo-fnd-pty-rl	http://www.omg.org/spec/EDMC-FIBO/FND/Parties/Roles/
fibo-fnd-plc-adr	http://www.omg.org/spec/EDMC-FIBO/FND/Places/Addresses/
fibo-fnd-plc-cty	http://www.omg.org/spec/EDMC-FIBO/FND/Places/Countries/
fibo-fnd-plc-fac	http://www.omg.org/spec/EDMC-FIBO/FND/Places/Facilities/
fibo-fnd-plc-loc	http://www.omg.org/spec/EDMC-FIBO/FND/Places/Locations/
fibo-fnd-plc-vrt	http://www.omg.org/spec/EDMC-FIBO/FND/Places/VirtualPlaces/
fibo-fnd-rel-rel	http://www.omg.org/spec/EDMC-FIBO/FND/Relations/Relations/
fibo-fnd-utl-av	http://www.omg.org/spec/EDMC-FIBO/FND/Utilities/AnnotationVocabulary/
fibo-fnd-utl-bt	http://www.omg.org/spec/EDMC-FIBO/FND/Utilities/BusinessFacingTypes/
fibo-fnd-utl-alx	http://www.omg.org/spec/EDMC-FIBO/FND/Utilities/Analytics/

Table 8.3 Prefix and Namespaces for FIBO Business Entities

Namespace Prefix	Namespace
fibo-be-oac-cpty	http://www.omg.org/spec/EDMC-FIBO/BE/OwnershipAndControl/ControlParties/
fibo-be-le-cb	http://www.omg.org/spec/EDMC-FIBO/BE/LegalEntities/CorporateBodies/

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fibo-be-oac-cctl	http://www.omg.org/spec/EDMC-FIBO/BE/OwnershipAndControl/CorporateControl/
fibo-be-oac-cown	http://www.omg.org/spec/EDMC-FIBO/BE/OwnershipAndControl/CorporateOwnership/
fibo-be-corp-corp	http://www.omg.org/spec/EDMC-FIBO/BE/Corporations/Corporations/
fibo-be-le-fbo	http://www.omg.org/spec/EDMC-FIBO/BE/LegalEntities/FormalBusinessOrganizations/
fibo-be-oac-exec	http://www.omg.org/spec/EDMC-FIBO/BE/OwnershipAndControl/Executives/
fibo-be-fct-fct	http://www.omg.org/spec/EDMC-FIBO/BE/FunctionalEntities/FunctionalEntities/
fibo-be-fct-pub	http://www.omg.org/spec/EDMC-FIBO/BE/FunctionalEntities/Publishers/
fibo-be-le-lp	http://www.omg.org/spec/EDMC-FIBO/BE/LegalEntities/LegalPersons/
fibo-be-le-lei	http://www.omg.org/spec/EDMC-FIBO/BE/LegalEntities/LEIEntities/
fibo-be-oac-opty	http://www.omg.org/spec/EDMC-FIBO/BE/OwnershipAndControl/OwnershipParties/
fibo-be-ptr-ptr	http://www.omg.org/spec/EDMC-FIBO/BE/Partnerships/Partnerships/
fibo-be-tr-tr	http://www.omg.org/spec/EDMC-FIBO/BE/Trusts/Trusts/

As described in the [FIBO Foundations] specification, the namespace approach taken for FIBO is based on OMG guidelines and is constructed as follows:

- A standard prefix `http://www.omg.org/spec/`
- The family name, `EDMC-FIBO`
- The abbreviation for the specification: in this case `IND`
- The module name
- The ontology name

Note that the URI/IRI strategy for the ontologies in FIBO takes a “slash” rather than “hash” approach, in order to accommodate server-side applications. Namespace prefixes are constructed as follows with the components separated by “-“:

Note that the URI/IRI strategy for the ontologies in FIBO takes a “slash” rather than “hash” approach, in order to accommodate server-side applications. Though not technically necessary, this specification does mandate namespace prefixes to be used. These are constructed as follows with the components separated by “-“:

- The specification family name `fibo`
- The specification abbreviation: `ind`
- An abbreviation for the module name

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An abbreviation for the ontology name

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The namespaces and prefixes corresponding to the primary FIBO Indices and Indicators (IND) ontologies are summarized in Table 8.2. These are given by module, and within a module in alphabetical order, rather than with any intent to show imports relationships. The table includes the namespace definitions for the "about" files that are part of the machine-readable deliverables for the specification, but that are not required for imports closure over the primary ontologies.

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~~The namespaces and prefixes corresponding to FIBO Indices and Indicators ontologies are summarized in Table 8.4 for convenience. These are given in alphabetical order, by module, rather than with any intent to show imports relationships.~~

Table 8.~~42~~ Prefix and Namespaces for FIBO Indices and Indicators

Namespace Prefix	Namespace
fibo-ind	http://www.omg.org/spec/EDMC-FIBO/IND/AboutIND/
fibo-ind-**1.0**	http://www.omg.org/spec/EDMC-FIBO/IND/1.0/AboutIND-1.0/
fibo-ind-ei-mod	http://www.omg.org/spec/EDMC-FIBO/IND/EconomicIndicators/AboutEconomicIndicators/
fibo-ind-ei-ei	http://www.omg.org/spec/EDMC-FIBO/IND/EconomicIndicators/EconomicIndicators/
fibo-ind-ei-pub	http://www.omg.org/spec/EDMC-FIBO/IND/EconomicIndicators/EconomicIndicatorPublishers/
fibo-ind-fx-mod~~**fibo-ind-ind-ind**~~	http://www.omg.org/spec/EDMC-FIBO/IND/ForeignExchange/AboutForeignExchange/~~**http://www.omg.org/spec/EDMC-FIBO/IND/Indicators/Indicators/**~~
fibo-ind-fx-fx	http://www.omg.org/spec/EDMC-FIBO/IND/ForeignExchange/ForeignExchange/
fibo-ind-ind-mod	http://www.omg.org/spec/EDMC-FIBO/IND/Indicators/AboutIndicators/
fibo-ind-ind-ind	http://www.omg.org/spec/EDMC-FIBO/IND/Indicators/Indicators/
fibo-ind-ir-mod	http://www.omg.org/spec/EDMC-FIBO/IND/InterestRates/AboutInterestRates/
fibo-ind-ir-ir	http://www.omg.org/spec/EDMC-FIBO/IND/InterestRates/InterestRates/
fibo-ind-ir-pub	http://www.omg.org/spec/EDMC-FIBO/IND/InterestRates/InterestRatePublishers/
~~**fibo-ind-ei-ei**~~	~~**http://www.omg.org/spec/EDMC-FIBO/IND/EconomicIndicators/EconomicIndicators/**~~
~~**fibo-ind-ei-pub**~~	~~**http://www.omg.org/spec/EDMC-FIBO/IND/EconomicIndicators/EconomicIndicatorPublishers/**~~

The namespaces and prefixes corresponding to the jurisdiction-specific FIBO Indices and Indicators (IND) ontologies, specified in clause 10, are summarized in Table 8.3.

Table 8.3 Prefix and Namespaces for FIBO Indices and Indicators (IND) Jurisdiction-specific Ontologies

Namespace Prefix	Namespace
fibo-ind-ei-caei	http://www.omg.org/spec/EDMC-FIBO/IND/EconomicIndicators/NorthAmericanIndicators/CAEconomicIndicators/

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fibo-ind-ei-usei	http://www.omg.org/spec/EDMC-FIBO/IND/EconomicIndicators/NorthAmericanIndicators/USEconomicIndicators/

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9 Model Content Reports

Issue	FIBOIND-19	Section 9.1, Introduction, is obsolete

9.1 Overview

This section lists all the terms, definitions and relationships in the Indices and Indicators models defined in this specification.

~~Please note that this section is not intended to be read by business subject matter experts; for this purpose, tabular reports and spreadsheets should be produced for this audience as described elsewhere in this specification.~~

~~9.1.1 Interpreting This Section~~

~~This section shows each of the components of the model with their OWL construct names where applicable. These are:~~

~~Construct Name~~	~~Description~~
~~**Module:**~~	~~A grouping of ontologies with some common theme. These also share a namespace fragment in the corresponding OWL files.~~
~~**Ontology**~~	~~A single OWL ontology.~~
~~**Class of Thing**~~	~~An OWL Class, that is, a set of individuals that share a common definition and common properties~~
~~**Relationship**~~	~~In OWL, relationships (object properties) between classes are binary, first class elements. The domain of a relationship is the class that has this relationship, i.e., the source; the range is the class that it is related to, or the target of the relationship.~~
~~**Parent**~~	~~**"is a"** relationships: these indicate that the child class is a sub-class of its parent class, in other words, the child class is a specialization of its parent class.~~
~~**Simple property**~~	~~Known as attributes in data modeling, and as data properties in OWL, simple properties are properties of their domain (source) class, whose values must be of the same type as their range (target) datatype, such as text or a numeric value.~~ ~~Known as "datatype property" in OWL.~~
~~**Datatype Property Range**~~	~~The type of information in which the OWL Datatype Property is framed~~ ~~Known as "Type" in the tables, where one column combines types of simple properties, and related things (ranges) of relationship properties~~ ~~NOTE: for some simple properties, the range is a DataEnumeration (see below).~~
~~**Data Enumeration**~~	~~These items represent a selection of possible values, which are intended to be taken as literal (e.g. textual) values. A "Simple property" (OWL Datatype Property) may identify one of these as the Simple property Type; this means that any one of the values in the list may be a possible value for this property.~~
~~**Logical Union**~~	~~A logical union of Classes. The membership of the union is shown in this specification in the "Related thing or type" column.~~
~~**Mutually exclusive**~~	~~Identifies two sets of which no one individual may be a member of both.~~ ~~Known as "disjoint" in OWL.~~

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Construct Name	Description
Definition	The SKOS Definition annotation, giving the formal definition of the concept
Explanatory Note	An annotation giving more detailed business-facing explanations for concepts.
Term Origin	The origin of the concept in some external source, which was directly used as a point of reference in deriving the concept indicated.
Definition Origin	The origin of the written definition for the concept in some external source, which was directly used as a point of reference in deriving the concept indicated.
Definition Adapted From	The origin of the written definition for the concept in some external source, which was adapted and used as a point of reference in deriving the concept indicated.
Restriction	A set theoretic construct representing the refinement of an existing relationship property. The restriction represents a set of things in the business domain, the set being everything which has the stated relationship restricted as shown. Restrictions may be a super-class of some class of thing (representing a necessary condition for membership of that class) or they may be shown as "equivalent to" that class of thing, meaning that the restriction represents necessary and sufficient conditions for membership of that class.

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9.2. Module: Indicators

Table 9.1 Indicators Module Metadata

Metadata Term	Value
sm:moduleName	Indicators
sm:moduleAbbreviation	FIBO-IND-IND
sm:moduleVersion	1.0
sm:moduleAbstract	This module includes ontologies for concepts common to all types of market index and market indicator or economic measure. These are all types of numeric parameter which vary over time, and are published by some source. These are divided into concepts descriptive of the numeric parameter, and concepts descriptive of the values which those parameters take over time.

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9.2.1 Ontology: Indicators

This ontology provides the concepts common to all market rates, indices and indicators; that is concepts descriptive of the numeric parameters themselves. These are modeled independently of the values they may take over time.

Issue	FIBOIND-6	Interest rates and exchange rates should be moved to a higher level of abstraction
Issue	FIBOIND-22	Additional concepts refining the concept of a market rate are needed to distinguish daily averages and end-of-day quotes

Table 9.2 Indicators Ontology Metadata

Metadata Term	Value
sm:filename	Indicators
sm:fileAbbreviation	fibo-ind-ind-ind
OntologyIRI	http://www.omg.org/spec/EDMC-FIBO/IND/Indicators/Indicators/
owl:versionIRI	http://www.omg.org/spec/EDMC-FIBO/IND/20165085501/Indicators/Indicators/
sm:dependsOn	http://www.omg.org/spec/EDMC-FIBO/FND/ http://www.omg.org/spec/EDMC-FIBO/BE/

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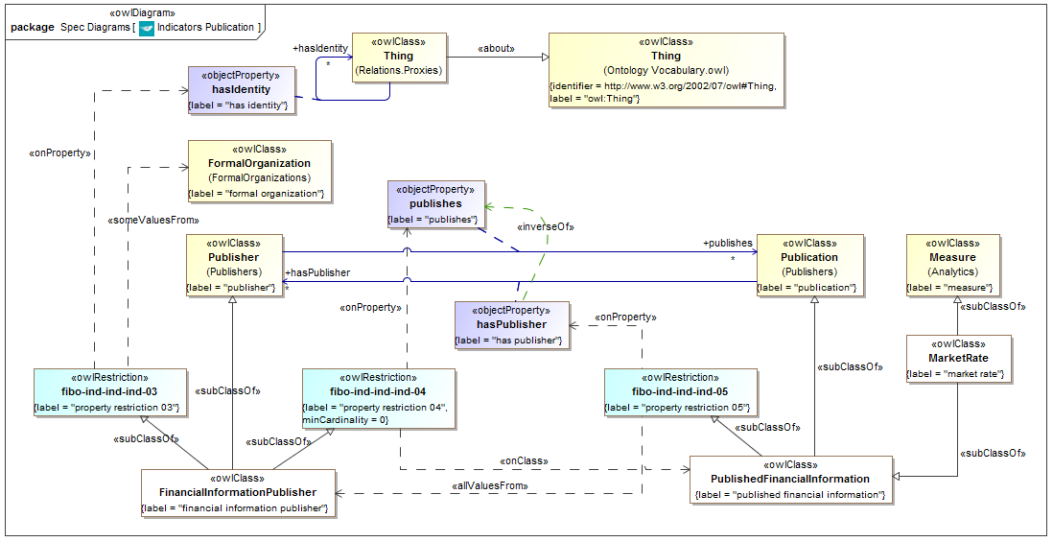

Figure 9.1 Indicators Publication Concepts

Diagram showing the basic concepts in the Indicators Publishers ontology for publication of market indices and indicators.

Issue	FIBOIND-6	Interest rates and exchange rates should be moved to a higher level of abstraction
Issue	FIBOIND-22	Additional concepts refining the concept of a market rate are needed to distinguish daily averages and end-of-day quotes

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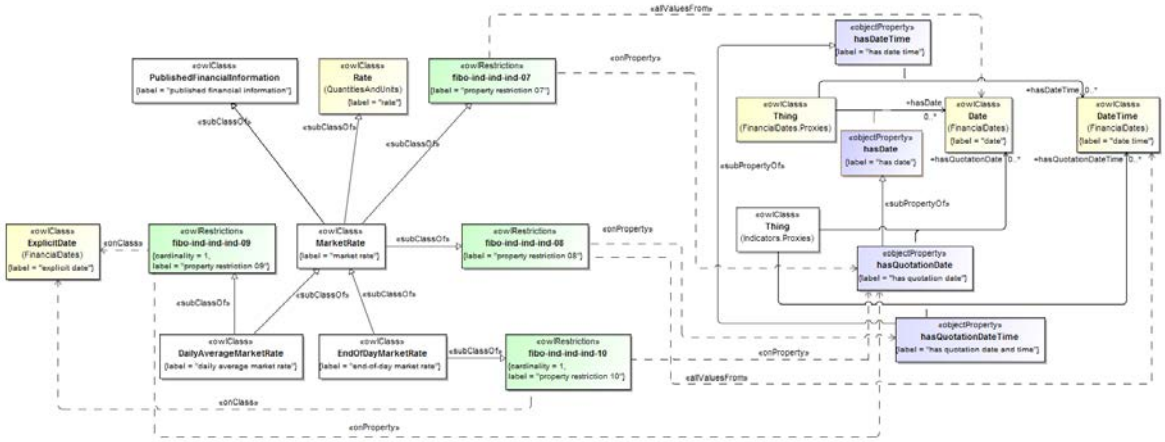

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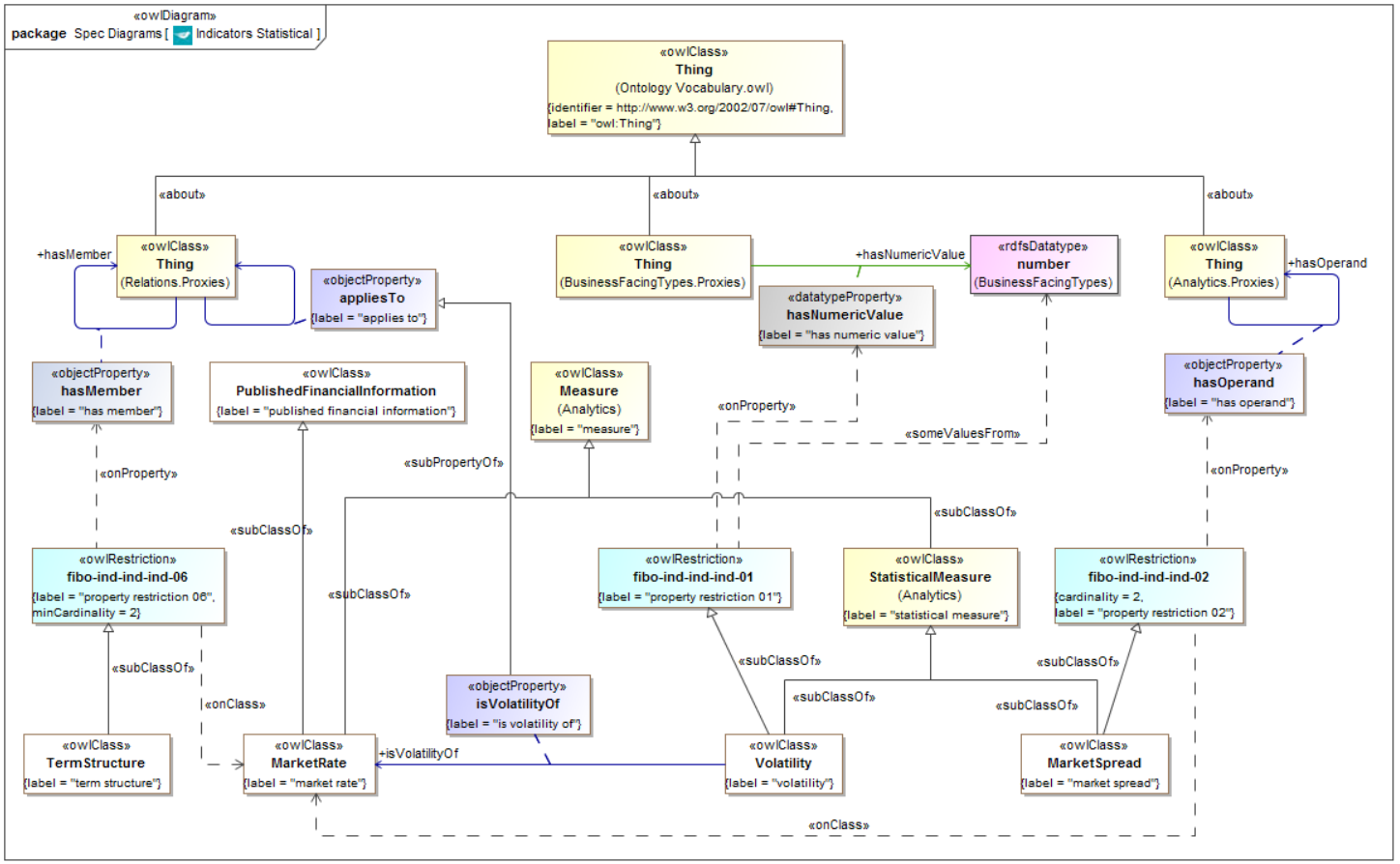

Figure 9.2 **Definition of Market Rate~~Indicators Analytical Concepts~~**

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Figure 9.2 defines market rates as published information, including but not limited to average daily and end-of-day rates.
~~Diagram showing the analytical or statistical types of indicator concept in the Indicators ontology.~~

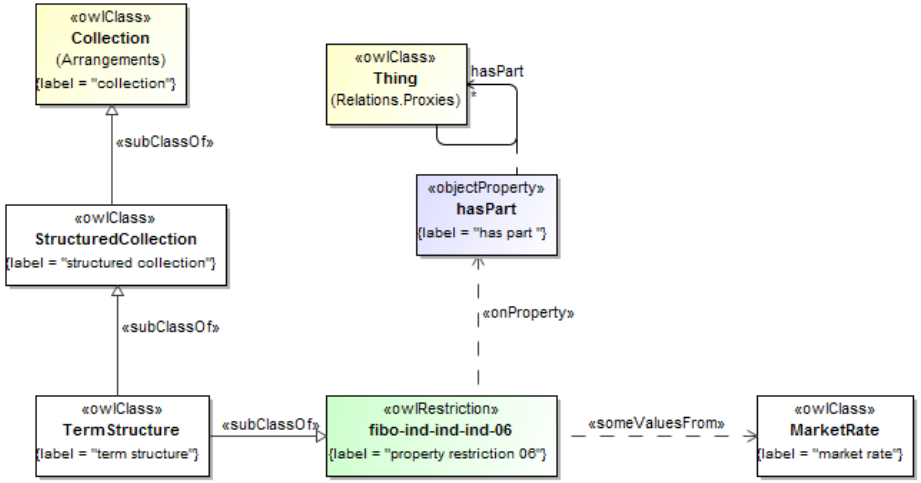

Figure 9.3 Definition of Term Structure

Figure 9.3 specifies a term structure as a structured collection of rates, such as interest rates or bond yields, with different terms to maturity, such that a yield curve may be constructed for the structure.

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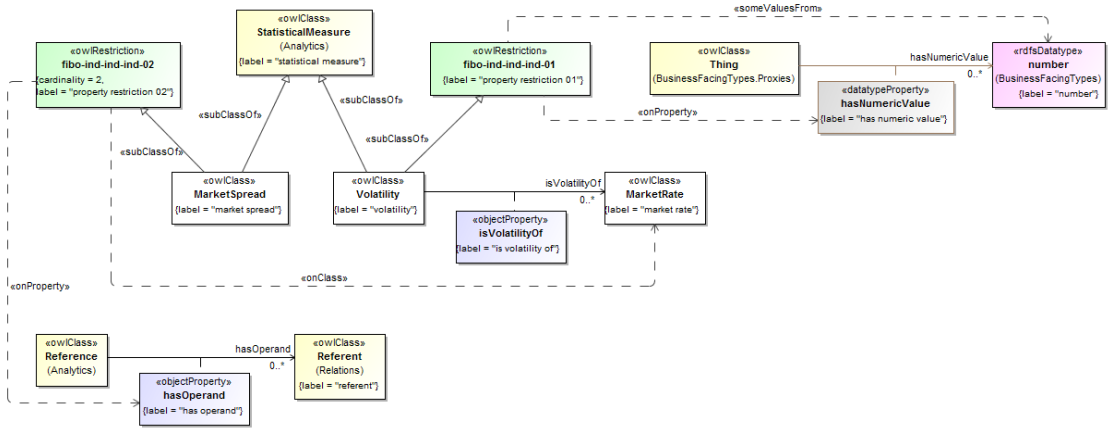

Figure 9.4 Definition of Statistical Measures

Figure 9.4 depicts two additional statistical measures relevant to analysis and market rates, namely market spread and volatility. Both are specified at a very high level for additional refinement in domain areas elsewhere in FIBO.

Issue	FIBOIND-22	Additional concepts refining the concept of a market rate are needed to distinguish daily averages and end-of-day quotes

Table 9.3 Indicators Ontology Details

~~**Classes**~~

~~**Name**~~	~~**Label**~~	~~**Definition**~~	~~**Parent**~~	~~**Explanatory Note**~~
~~FinancialInformationPublisher~~	~~financial information publisher~~	~~a formal organization acting as a publisher or provider of information related to the financial markets or of interest to financial market participants such as information on economics.~~	~~property restriction 04 property restriction 03 publisher~~	

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Name	Label	Definition	Parent	Explanatory Note
MarketRate	market rate	a measure that is also published financial information providing a rate used to measure market trends for a set of instruments (S&P500, NASDAQ composite, 30 day CD) or that describes the economic climate for an industry (DowJones Industrial, H&Q Growth Technologies) and/or political region (Libor, Prime)	measure published financial information	
MarketSpread	market spread	a statistical measure providing the difference (or spread) between two market rates.	statistical measure property restriction 02	
PublishedFinancialInformation	published financial information	published information made available by a financial information publisher	property restriction 05 publication	
TermStructure	term structure	two or more related instruments with different terms to maturity, such that a yield curve may be constructed for the structure	property restriction 06	
Volatility	volatility	a statistical measure of the rate of change in pricing for a given security or market index	statistical measure property restriction 01	Volatility can be determined using the standard deviation or variance among prices for the security or market index over some period of time. For a specific security, volatility may measure the amount and frequency in rapid price fluctuation. It is computed as the annualized standard

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Name	Label	Definition	Parent	Explanatory Note
				deviation of the percentage change in a security's daily price.

Properties for Volatility

Name	Property	Domain	Range	Definition	Parent
isVolatilityOf	is volatility of	volatility	market rate	a predicate indicating the market rate to which the volatility measure applies and of which it is a measure.	applies to

Restrictions

Name	Label	Expressions
fibo-ind-ind-ind-01	property restriction 01	hasNumericValue some number
fibo-ind-ind-ind-02	property restriction 02	hasOperand exactly 2 MarketRate
fibo-ind-ind-ind-03	property restriction 03	hasIdentity some FormalOrganization
fibo-ind-ind-ind-04	property restriction 04	publishes min 0 PublishedFinancialInformation
fibo-ind-ind-ind-05	property restriction 05	hasPublisher only FinancialInformationPublisher
fibo-ind-ind-ind-06	property restriction 06	hasMember min 2 MarketRate

Classes

Name	Annotations	Class Expressions
DailyAverageMarketRate (daily average market rate)	Definition: a measure of the overall price level of a given rate, calculated as the sum of all values of the rates for a particular reference rate, foreign exchange rate, lending rate, or other market rate divided by the total number of rates collected over the course of a twenty-four (24) hour period for a specific date	Parent Class: MarketRate Property Restriction: = 1 **hasQuotationDate**.**ExplicitDate** (fibo-ind-ind-ind-09)

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	Adapted from: http://www.investopedia.com/terms/m/marketaverage.asp	
EndOfDayMarketRate (end-of-day market rate)	Definition: a measure of the price level (value) of a given market rate of the end of the business day for a specific date	Parent Class: MarketRate Property Restriction: = 1 **hasQuotationDate**.**ExplicitDate** (fibo-ind-ind-ind-10)
FinancialInformationPublisher (financial information publisher)	Definition: a formal organization acting as a publisher or provider of information related to the financial markets or of interest to financial market participants such as information on economies	Parent Class: Publisher Property Restriction: ∃ **hasIdentity**. **FormalOrganization** (fibo-ind-fctind-ind-03) Property Restriction: ≥ 0 **publishes**.**PublishedFinancialInformation** (fibo-ind-ind-ind-04)
MarketRate (market rate)	Definition: a measure that is also published financial information providing a rate used to measure market trends for a set of instruments (S&P500, NASDAQ composite, 30 day CD) or that describes the economic climate for an industry (Dow Jones Industrial Average (DJIA), H&Q Growth Technologies) and/or political region (LIBOR, Prime) Example: Financial market rates include, but are not limited to reference rates, foreign exchange rates, lending rates, bankers' acceptance rates, and so forth. Scope note: known collectively (in the CFI Standard) as referential instruments Scope note: Market rates include but may not be limited to the following: (1) Index: Statistical composite that measures changes in the economy or in financial markets, often expressed in percentage changes from a base year or from the previous month (2) Money Rate: Benchmark or guideline for interest rates determined by central banks or economical climate as a whole (3) Bankers' Acceptance Rate: Benchmark reflecting market fluctuations of Bankers' Acceptance issued instruments	Parent Class: Rate, PublishedFinancialInformation Property Restriction: ∀ **hasQuotationDate**.**Date** (fibo-ind-ind-ind-07) Property Restriction: ∀ **hasQuotationDateTime**.**DateTime** (fibo-ind-ind-ind-08)

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	(4) Commercial Paper Rate: Benchmark reflecting market fluctuations of Commercial Paper issued instruments (5) Certificate of Deposit Rate: Benchmark reflecting market fluctuations of Certificate of Deposit issued instruments (6) Interbank Rate (7) Prime (8) Time Deposit Rate: Benchmark reflecting market fluctuations of Deposit/Redeposit issued instruments	
MarketSpread (market spread)	Definition: a statistical measure providing the difference (or spread) between two market rates	Parent Class: StatisticalMeasure Property Restriction: = 2 **hasOperand**.**MarketRate** (fibo-ind-ind-ind-02)
PublishedFinancialInformation (published financial information)	Definition: published information made available by a financial information publisher	Parent Class: Publication Property Restriction: ∀ **hasPublisher**.**FinancialInformationPublisher** (fibo-ind-ind-ind-05)
StructuredCollection (structured collection)	Definition: a collection that has a clearly defined structure or organization	Parent Class: Collection
TermStructure (term structure)	Definition: a structured collection of rates, such as interest rates, or bond yields with different terms to maturity, such that a yield curve may be constructed for the structure Explanatory note: The term structure reflects expectations of market participants about future changes in interest rates and their assessment of monetary policy conditions. Scope note: Term Structure has been modeled with reference to MarketRate generally, which incorporates more kinds of rate than would normally be included in a term structure. Term structures consist of two or more of something with some time to maturity, typically debt instruments or interest rates. Currency exchange rates may in principle be grouped in a term structure as forward rates. For this specification, debt instruments are not in scope, so these are not included in the current scope of this TermStructure concept. Editorial note: Term structure refers to a set of discrete points; elements are ordered by time. Restrictions on the rate (see above) and a point in time, paired together, and then ordered in a structured collection is how	Parent Class: StructuredCollection Property Restriction: ∃ **hasPart**.**MarketRate** (fibo-ind-ind-ind-06)

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	this should ultimately be modeled. Then the concept of yield curve would be a child of term structure, for calculation of net present value, for example. Adapted from: http://www.investopedia.com/terms/t/termstructure.asp	
Volatility (volatility)	Definition: a statistical measure of the rate of change in pricing for a given security or market index Explanatory note: Volatility can be determined using the standard deviation or variance among prices for the security or market index over some period of time. For a specific security, volatility may measure the amount and frequency in rapid price fluctuation. It is computed as the annualized standard deviation of the percentage change in a security's daily price. Adapted from: OptionsEducation.org	Parent Class: StatisticalMeasure Property Restriction: ∃ **hasNumericValue**.**number** (fibo-ind-ind-ind-01)

Properties

Name	Annotations	Property Axioms
hasQuotationDate (has quotation date)	Definition: a predicate indicating the quotation date for a given market rate or indicator Explanatory note: Typically this property reflects a daily average or end of day quote.	Parent Property: hasDate Range: Date
hasQuotationDateTime (has quotation date and time)	Definition: a predicate indicating the quotation date and time for a given market rate or indicator	Parent Property: hasDateTime Range: DateTime
isVolatilityOf (is volatility of)	Definition: a predicate indicating the market rate to which the volatility measure applies and of which it is a measure	Parent Property: appliesTo Domain: Volatility Range: MarketRate

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9.3 Module: Foreign Exchange

Table 9.4 Foreign Exchange Module Metadata

Metadata Term	Value
sm:moduleName	Foreign Exchange
sm:moduleAbbreviation	FIBO-IND-FX
sm:moduleVersion	1.0
sm:moduleAbstract	This module includes ontologies defining concepts to do with foreign exchange.

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9.3.1 Ontology: Foreign Exchange

This ontology provides the parameters for foreign exchange rates, covering spot and forward rates, as well as Fx spot rate volatilities.

Issue	FIBOIND-6	Interest rates and exchange rates should be moved to a higher level of abstraction
Issue	FIBOIND-22	Additional concepts refining the concept of a market rate are needed to distinguish daily averages and end-of-day quotes

Table 9.5 Foreign Exchange Ontology Metadata

Metadata Term	Value
sm:filename	ForeignExchange
sm:fileAbbreviation	fibo-ind-fx-fx
OntologyIRI	http://www.omg.org/spec/EDMC-FIBO/IND/ForeignExchange/ForeignExchange/
owl:versionIRI	http://www.omg.org/spec/EDMC-FIBO/IND/20165085501/ForeignExchange/ForeignExchange/
sm:dependsOn	http://www.omg.org/spec/EDMC-FIBO/FND/ http://www.omg.org/spec/EDMC-FIBO/IND/Indicators/Indicators/

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Issue	FIBOIND-6	Interest rates and exchange rates should be moved to a higher level of abstraction
Issue	FIBOIND-22	Additional concepts refining the concept of a market rate are needed to distinguish daily averages and end-of-day quotes

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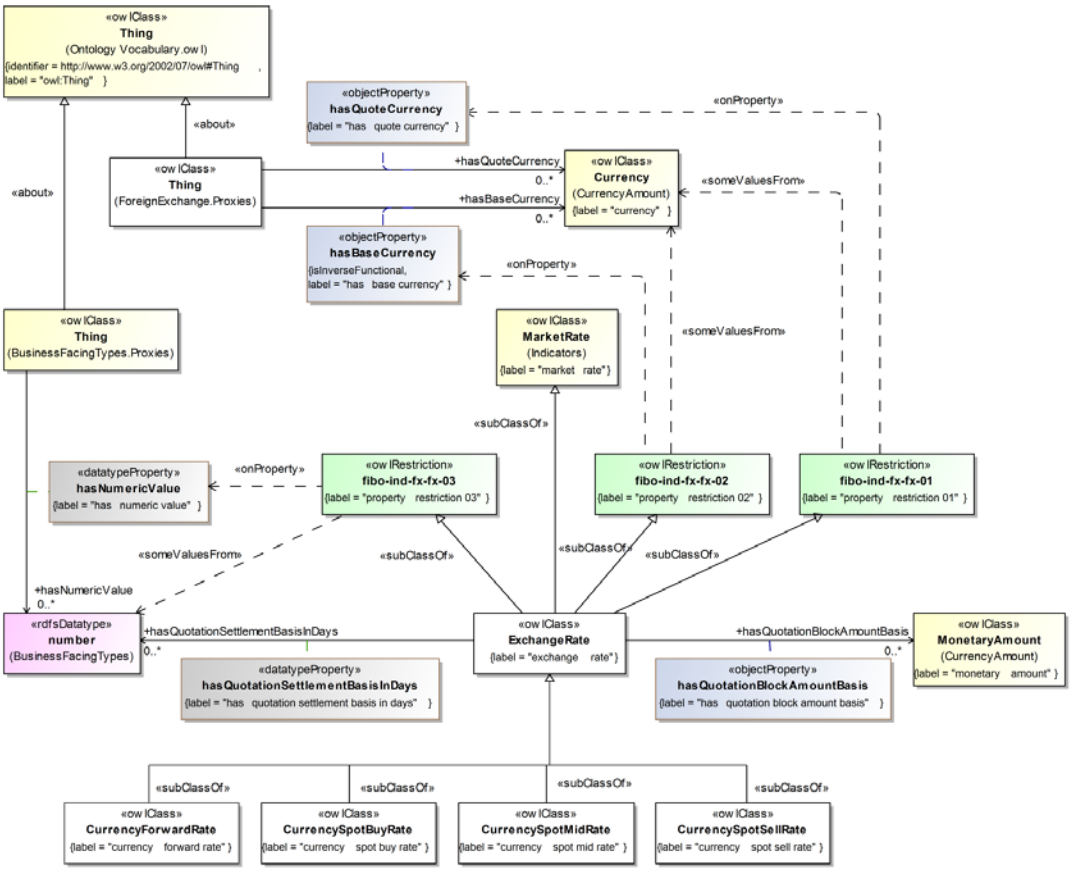

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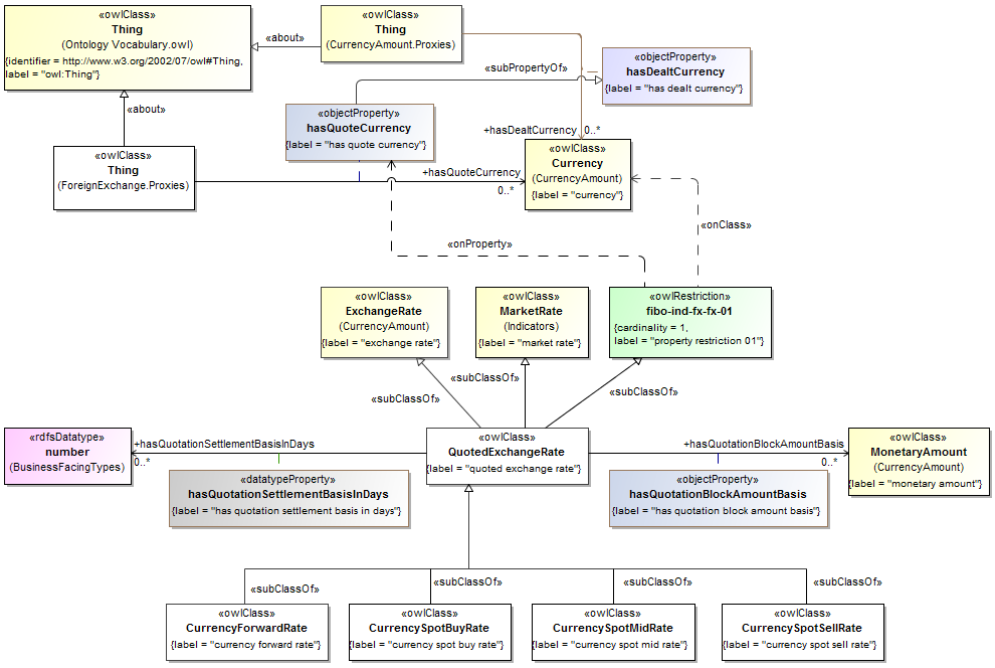

Figure 9.3 Foreign Exchange: Exchange Rate Concepts

Diagram showing the basic concepts in the Foreign Exchange ontology.

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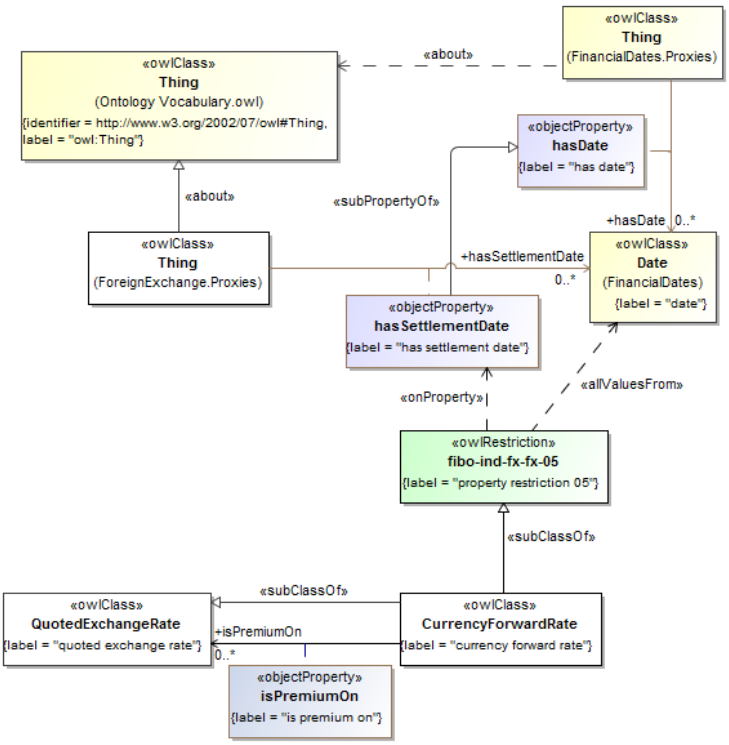

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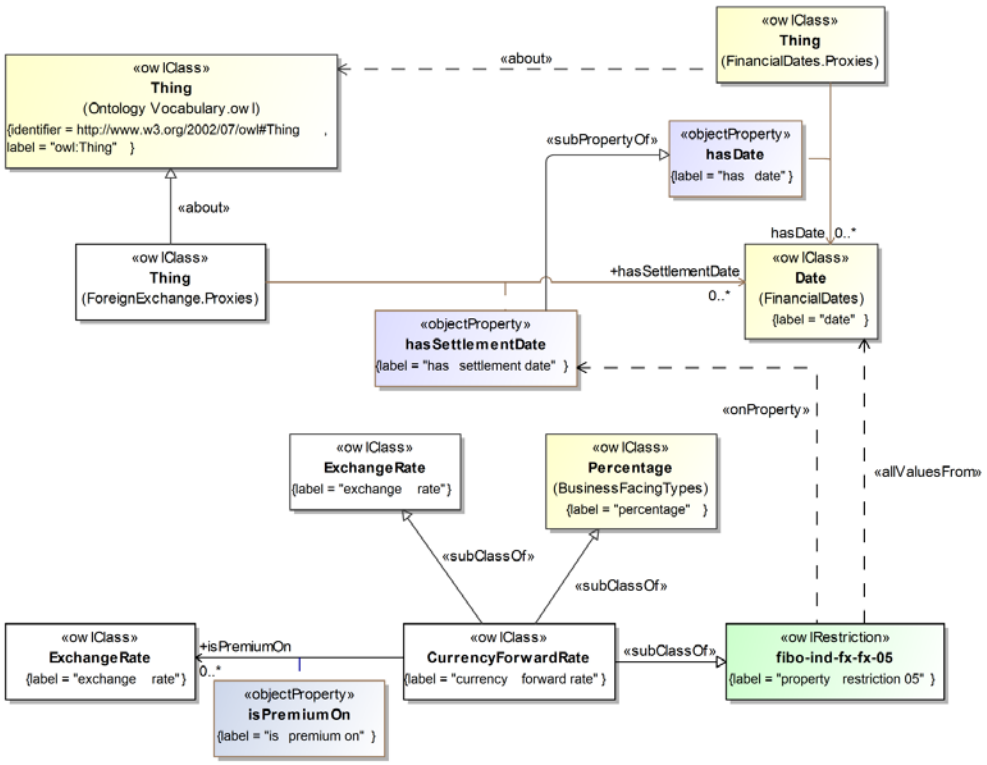

Figure 9.4 **Foreign Exchange: Forward Rate Concepts**

Diagram showing forward rate concepts in the Foreign Exchange ontology.

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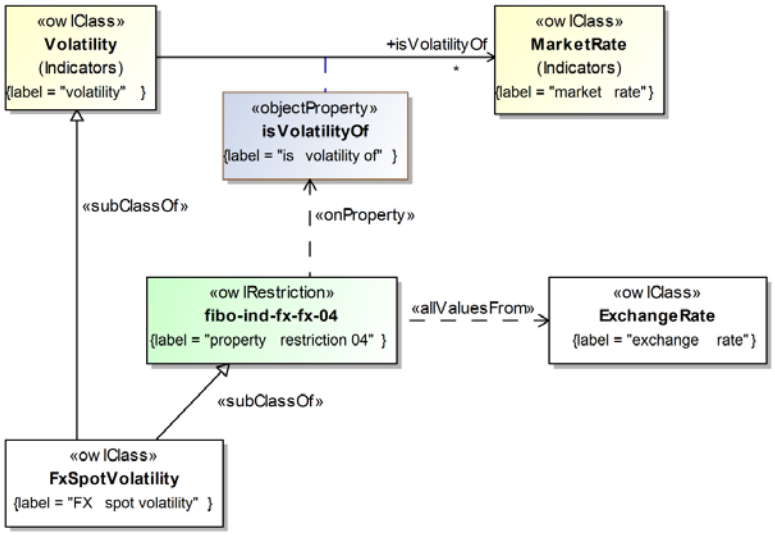

Figure 9.5 **Foreign Exchange: Spot Volatility Concepts**

Diagram showing the concepts of spot -rate volatility in the Foreign Exchange ontology.

Issue	FIBOIND-6	Interest rates and exchange rates should be moved to a higher level of abstraction
Issue	FIBOIND-22	Additional concepts refining the concept of a market rate are needed to distinguish daily averages and end-of-day quotes

Table 9.6 **Foreign Exchange Ontology Details**

~~Classes~~

~~Name~~	~~Label~~	~~Definition~~	~~Parent~~	~~Explanatory Note~~
~~CurrencyForwardRate~~	~~currency forward rate~~	~~a rate of exchange between two currencies for settlement at some future point in time, expressed as a premium on the spot rate~~	~~property restriction 05 exchange rate percentage~~	
~~CurrencySpotBuyRate~~	~~currency spot buy rate~~	~~an indicative spot buying market rate as observed by the reporting source~~	~~exchange rate~~	
~~CurrencySpotMidRate~~	~~currency spot mid rate~~	~~an indicative middle market (mean of spot buying and selling) rate as observed by the reporting source~~	~~exchange rate~~	

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Name	Label	Definition	Parent	Explanatory Note
CurrencySpotSellRate	currency spot sell rate	an indicative spot selling market rate as observed by the reporting source	exchange rate	
ExchangeRate	exchange rate	An indicative, quoted exchange rate at a point in time, for a given block amount of currency as quoted against another (base) currency, for settlement at a defined point in the immediate future.	property restriction 03 property restriction 02 property restriction 01 market rate	For example an exchange rate of R represents a rate of R units of the dealt currency to 1 unit of the base currency.
FxSpotVolatility	FX spot volatility	A measure of exchange rate fluctuation. Mathematically the volatility is the annualized standard deviation of the daily changes in the exchange rate.	volatility property restriction 04	

Properties

Name	Label	Domain	Range	Definition	Explanatory Note
hasBaseCurrency	has base currency		currency	a predicate indicating the base currency in an exchange rate; one unit of this currency represents R units of the dealt currency, where R is the exchange rate value	
hasQuotationBlockAmountBasis	has quotation block amount basis	exchange rate	monetary amount	the amount of the dealt currency which would be exchanged in a trade for which the stated spot rate applies	
hasQuotationSettlementBasisInDays	has quotation settlement basis in days	exchange rate	number	the settlement period in days for a trade for which the stated spot rate applies	
hasQuoteCurrency	has quote currency		currency	a predicate indicating the quote currency in an exchange rate; R units of this currency represent one unit of the base currency	
hasSettlementDate	has settlement date		Date	a predicate indicating the settlement date of a given transaction	subpropertyOf hasDate
isPremiumOn	is premium on	currency forward rate	exchange rate	The currency forward rate is expressed as a premium on the spot rate for the currency pair	

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~~Name~~	~~Label~~	~~Domain~~	~~Range~~	~~Definition~~		~~Explanatory Note~~

~~Restrictions~~

~~Name~~	~~Label~~	~~Expressions~~
~~fibo-ind-fx-fx-01~~	~~property restriction 01~~	~~hasQuoteCurrency some Currency~~
~~fibo-ind-fx-fx-02~~	~~property restriction 02~~	~~hasBaseCurrency some Currency~~
~~fibo-ind-fx-fx-03~~	~~property restriction 03~~	~~hasNumericValue some number~~
~~fibo-ind-fx-fx-04~~	~~property restriction 04~~	~~isVolatilityOf only ExchangeRate~~
~~fibo-ind-fx-fx-05~~	~~property restriction 06~~	~~hasSettlementDate only Date~~

Classes

Name	Annotations	Class Expressions
CurrencyForwardRate (currency forward rate)	Definition: a rate of exchange between two currencies for settlement at some future point in time, expressed as a premium on the spot rate	Parent Class: QuotedExchangeRate Property Restriction: ∀ **hasSettlementDate**.**Date** (fibo-ind-fx-fx-05)
CurrencySpotBuyRate (currency spot buy rate)	Definition: an indicative spot buying market rate as observed by the reporting source	Parent Class: QuotedExchangeRate
CurrencySpotMidRate (currency spot mid rate)	Definition: an indicative middle market (mean of spot buying and selling) rate as observed by the reporting source	Parent Class: QuotedExchangeRate
CurrencySpotSellRate (currency spot sell rate)	Definition: an indicative spot selling market rate as observed by the reporting source	Parent Class: QuotedExchangeRate
FxSpotVolatility (FX spot volatility)	Definition: a measure of exchange rate fluctuation Explanatory note: Mathematically, volatility is the annualized standard deviation of the daily changes in the exchange rate. Adapted from: OptionsEducation.org	Parent Class: Volatility Property Restriction: ∀ **isVolatilityOf**.**ExchangeRate** (fibo-ind-fx-fx-04)
QuotedExchangeRate (quoted exchange rate)	Definition: an exchange rate quoted at a specific point in time, for a given block amount of currency as quoted against another (base) currency Explanatory note: An exchange rate of R represents a rate of R units of the quoted currency to 1 unit of the base currency.	Parent Class: StatisticalMeasure Property Restriction: = 1 **hasQuoteCurrency**.**Currency** (fibo-ind-fx-fx-01)

Properties

Name	Annotations	Property Axioms
hasQuotationBlockAmountBasis (has quotation block amount basis)	Definition: the amount of the dealt currency which would be exchanged in a trade for which the stated spot rate applies	Domain: QuotedExchangeRate Range: MonetaryAmount
hasQuoteCurrency (has quote currency)	Definition: a predicate indicating the quote currency in an exchange rate; R units of this currency represent one unit of the base currency	Parent Property: hasDealtCurrency Range: Currency

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hasSettlementDate (has settlement date**)**	Definition: a predicate indicating the settlement date of a given transaction	Parent Property: hasDate Range: Date
isPremiumOn (is premium on**)**	Definition: an exchange rate expressed as a premium on the spot rate for the currency pair	Domain: CurrencyForwardRate Range: QuotedExchangeRate
hasQuotationSettlementBasisInDays (has quotation settlement basis in days**)**	Definition: the settlement period in days for a trade for which the stated spot rate applies	Domain: QuotedExchangeRate Range: number

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9.4 Module: Interest Rates

Table 9.7 Interest Rates Module Metadata

Metadata Term	Value
sm:moduleName	InterestRates
sm:moduleAbbreviation	FIBO-IND-IR
sm:moduleVersion	1.0
sm:moduleAbstract	This module includes ontologies defining concepts to do with interest rates, that is rates of interest paid on capital by banks and other lenders, including inter-bank lending rates and rates of certain representative debt instruments.

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9.4.1 Ontology: Interest Rates

This ontology provides the basic types of interest rate which are recognized in the financial markets, and the relationships between these where applicable. These include bank base rates, inter-bank offer rates, overnight rates of interest and the US Federal Funds rate which is widely used as a rate of reference. It also includes the concept of a market rate spread between two interest rates.

Issue	FIBOIND-6	Interest rates and exchange rates should be moved to a higher level of abstraction
Issue	FIBOIND-29	Eliminate deprecated elements from the Interest Rates ontology and reformat table per the other resolutions

Table 9.8 Interest Rates Ontology Metadata

Metadata Term	Value
sm:filename	InterestRates
sm:fileAbbreviation	fibo-ind-ir-ir
OntologyIRI	http://www.omg.org/spec/EDMC-FIBO/IND/InterestRates/InterestRates/
owl:versionIRI	http://www.omg.org/spec/EDMC-FIBO/IND/20165085501/InterestRates/InterestRates/
sm:dependsOn	http://www.omg.org/spec/EDMC-FIBO/FND/ http://www.omg.org/spec/EDMC-FIBO/IND/Indicators/Indicators/

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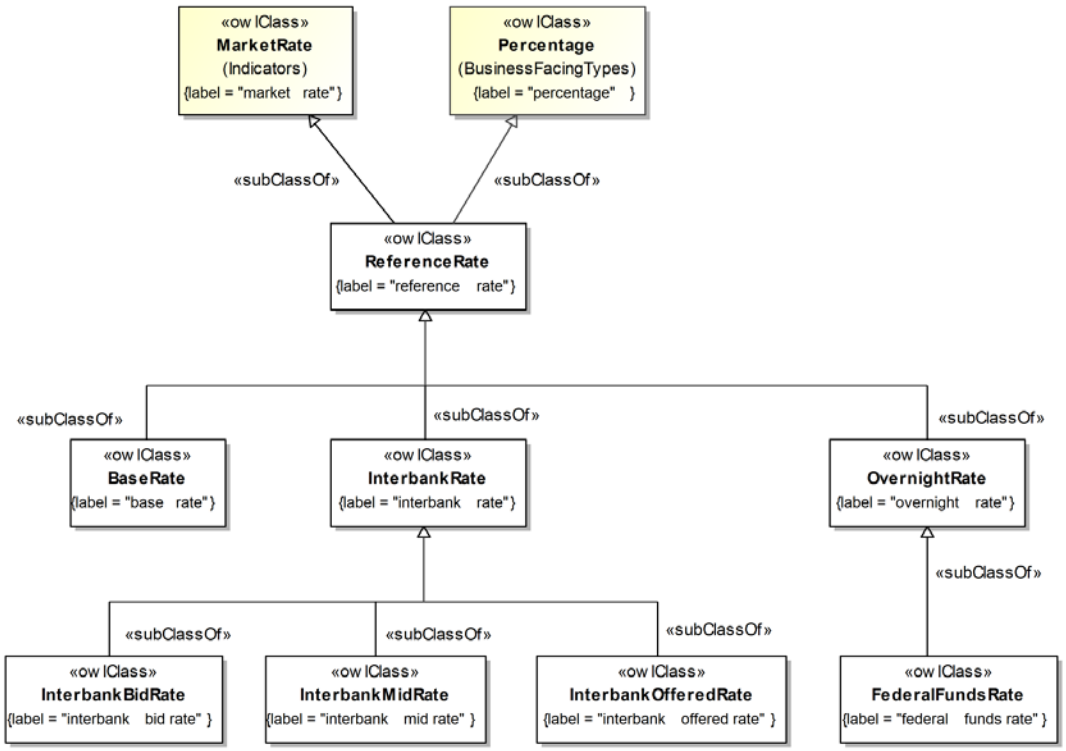

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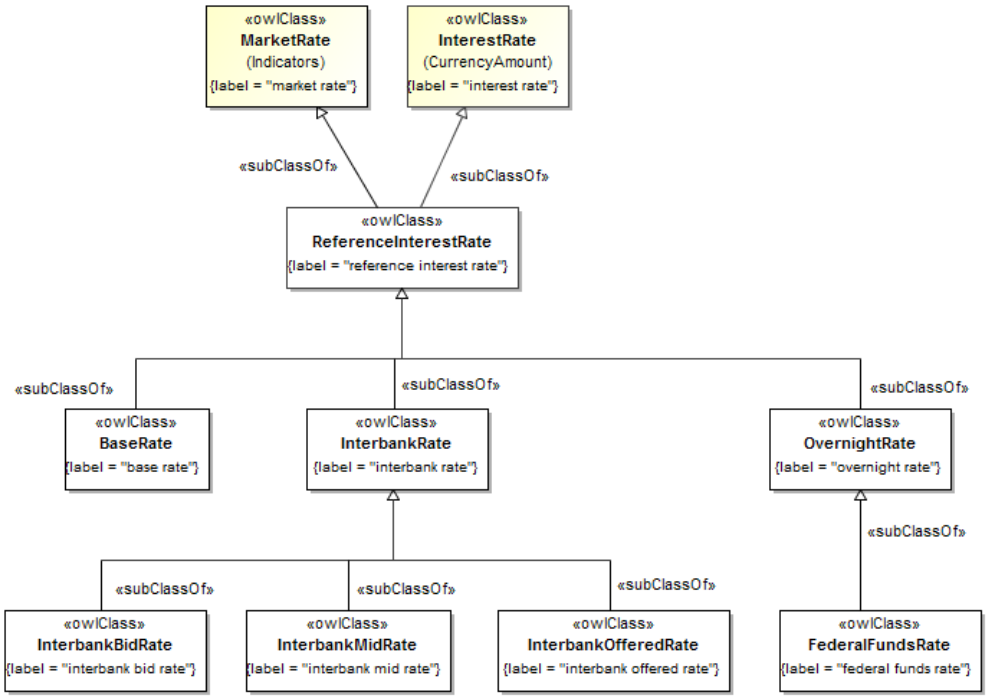

Figure 9.6 Interest Rates Concepts

Figure 9.6, above, depicts the primary concepts in the Interest Rates ontology.

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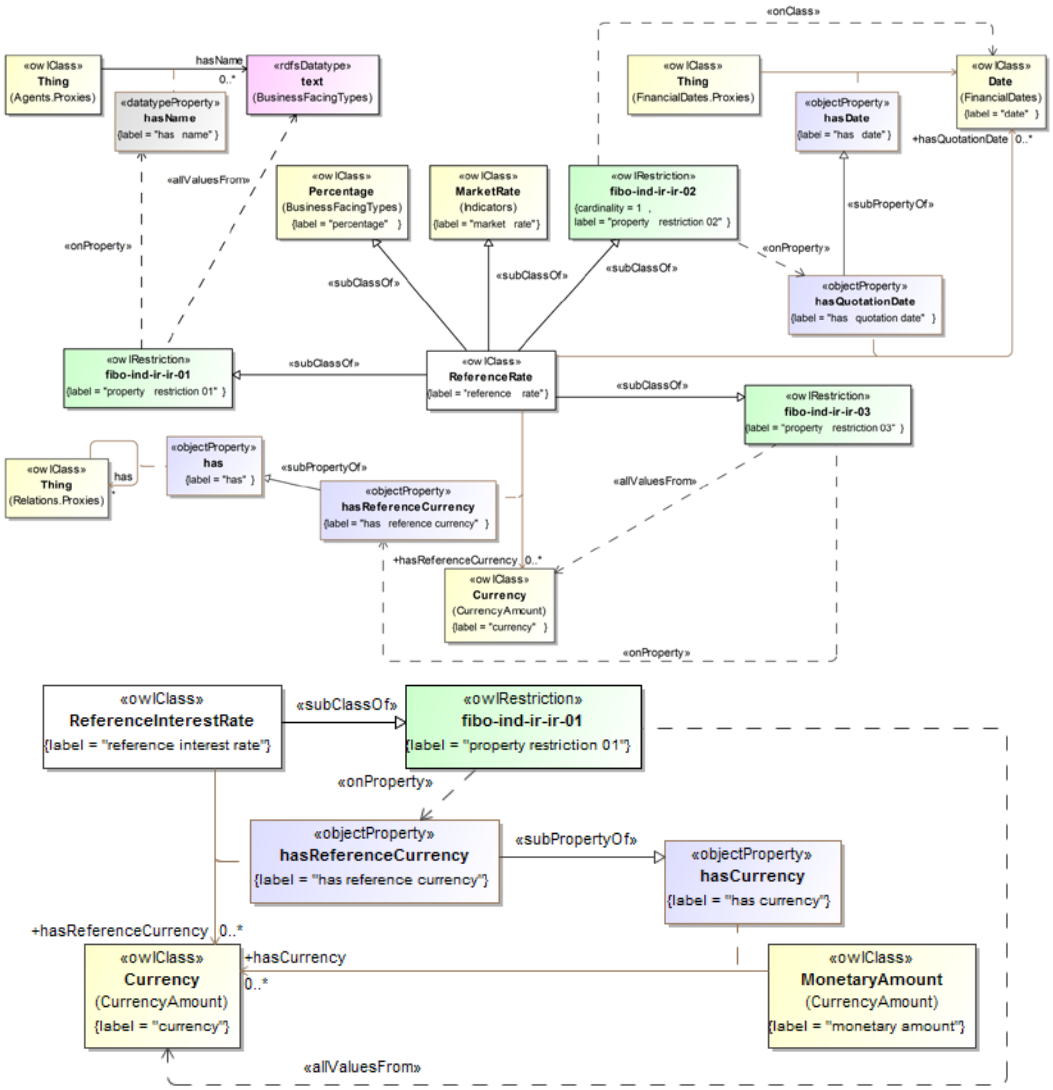

Figure 9.7 Reference Interest Rate Definition

Figure 9.7 defines reference interest rates, which are interest rates that can be used for reference purposes in financial instruments, market valuations and so forth.

~~Figure 9.7 provides a definition of ReferenceRate, which indicates any interest rate that can be used as a reference rate in valuations and so forth.~~

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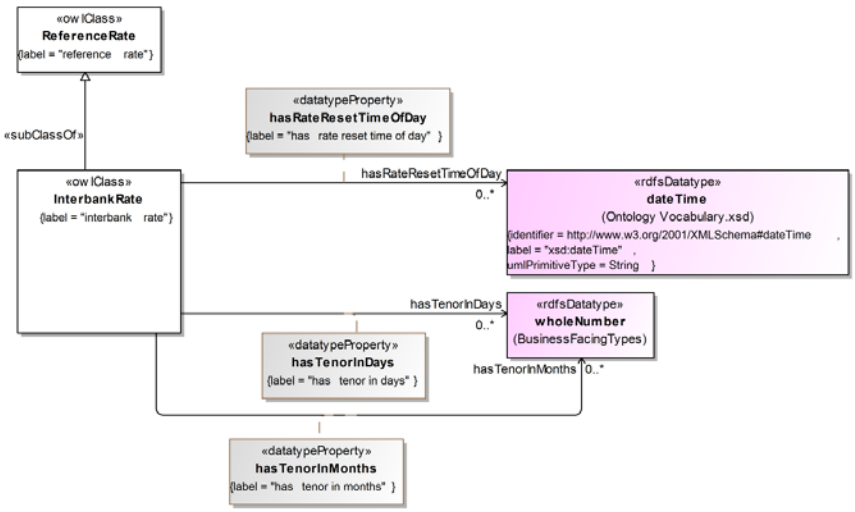

Figure 9.8 Interbank Rates Definition

Interbank offer rates are among the most common reference rates used by banks to lend money to one another for cash management and other purposes.

Issue	FIBOIND-6	Interest rates and exchange rates should be moved to a higher level of abstraction
Issue	FIBOIND-29	Eliminate deprecated elements from the Interest Rates ontology and reformat table per the other resolutions

~~**Table 9.9 Interest Rates Details**~~

~~**Classes**~~

~~Name~~	~~typeOfThing~~	~~definition~~	~~parent~~	~~explanatoryNote~~
~~ReferenceRate~~	~~reference rate~~	~~a market rate that is a rate of interest paid by or agreed among some bank or set of banks~~	~~property restriction 03 property restriction 02 property restriction 01 market rate, percentage~~	~~The reference rate is a moving index such as LIBOR, the prime rate or the rate on benchmark U.S. Treasuries.~~
~~OvernightRate~~	~~overnight rate~~	~~a reference rate that is an interest rate at which a depository institution lends funds to another depository institution (short term), or the interest rate the central bank charges a financial institution to borrow money overnight~~	~~reference rate~~	~~The overnight rate is the lowest available interest rate, and as such, it is only available to the most creditworthy institutions. It is the underlying rate for Overnight Interest Rate Swaps (IOS).~~

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Name	typeOfThing	definition	parent	explanatoryNote
InterbankRate	interbank rate	a reference rate that is the rate of interest charged on short-term loans between banks	reference rate	Banks borrow and lend money in the interbank market in order to manage liquidity and meet the requirements placed on them. The interest rate charged depends on the availability of money in the market, on prevailing rates and on the specific terms of the contract, such as term length.
InterbankOfferedRate	interbank offered rate	an interbank rate that is the interest rate at which participating banks lend money	interbank rate	
InterbankMidRate	interbank mid rate	an interbank rate that represents the mid-point between bid and offer rates	interbank rate	
InterbankBidRate	interbank bid rate	an interbank rate that is the interest rate at which participating banks are willing to borrow deposits from other banks	interbank rate	Unlike an interbank offered rate, which is the rate at which banks lend money, an interbank bid rate is the rate at which banks ask to borrow.
FederalFundsRate	federal funds rate, US federal funds rate, fed funds rate	a reference rate that is the interest rate at which a depository institution lends funds maintained at the Federal Reserve to another depository institution overnight.	overnight rate	By trading government securities, the New York Fed affects the federal funds rate, which is the interest rate at which depository institutions lend balances to each other overnight. The Federal Open Market Committee establishes the target rate for trading in the federal funds market. The federal funds rate is generally only applicable to the most creditworthy institutions when they borrow and lend overnight funds to each other. The federal funds rate is one of the most influential interest rates in the U.S. economy, since it affects monetary and financial conditions, which in turn have a bearing on key aspects of the broad economy including employment, growth and inflation. The Federal Open Market Committee (FOMC), which is the Federal Reserve's primary monetary policymaking body, telegraphs its desired target for the federal funds rate through open market operations.

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Name	typeOfThing	definition	parent	explanatoryNote
BaseRate	base rate	a reference rate that is the base rate set by a central bank for a given currency	reference rate	This is set at intervals.

Properties

Name	Label	Domain	Range	Definition
hasQuotationDate	has quotation date	ReferenceRate	Date	relates a reference rate to the date it was quoted on
hasReferenceCurrency	has reference currency	ReferenceRate	Currency	relates a reference rate to the currency it is based on
hasRateResetTimeOfDay	has rate reset time of day	interbank rate	xsd:dateTime	a predicate indicating the time of day when the rate is reset e.g., 11:00
hasTenorInDays	has tenor in days	interbank rate	whole number	a predicate indicating the length of time for which the interbank rate is quoted expressed as a number of days
hasTenorInMonths	has tenor in months	interbank rate	whole number	a predicate indicating the length of time for which the interbank rate is quoted, e.g., 3 months, 6 months expressed as a number of months

Restrictions

Name	Label	Expressions
fibo-ind-ir-ir-01	property restriction 01	hasName only text
fibo-ind-ir-ir-02	property restriction 02	hasQuotationDate exactly 1 Date
fibo-ind-ir-ir-03	property restriction 03	hasReferenceCurrency only Currency

Table 9.9 Interest Rates Ontology Details

Classes

Name	Annotations	Class Expressions
BaseRate (base rate)	Definition: a reference rate that is the base rate set by a central bank for a given currency Explanatory note: This is set at intervals.	Parent Class: ReferenceInterestRate
FederalFundsRate (US federal funds rate, fed funds rate, federal funds rate)	Definition: a reference rate that is the interest rate at which a depository institution lends funds maintained at the Federal Reserve to another depository institution overnight	Parent Class: OvernightRate

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	Explanatory note: By trading government securities, the New York Fed affects the federal funds rate, which is the interest rate at which depository institutions lend balances to each other overnight. The Federal Open Market Committee establishes the target rate for trading in the federal funds market. Explanatory note: The federal funds rate is generally only applicable to the most creditworthy institutions when they borrow and lend overnight funds to each other. The federal funds rate is one of the most influential interest rates in the U.S. economy, since it affects monetary and financial conditions, which in turn have a bearing on key aspects of the broad economy including employment, growth and inflation. The Federal Open Market Committee (FOMC), which is the Federal Reserve's primary monetary policymaking body, telegraphs its desired target for the federal funds rate through open market operations. See also: http://www.newyorkfed.org/markets/omo/dmm/fedfundsdata.cfm	
InterbankBidRate (interbank bid rate)	Definition: an interbank rate that is the interest rate at which participating banks are willing to borrow deposits from other banks Explanatory note: Unlike an interbank offered rate, which is the rate at which banks lend money, an interbank bid rate is the rate at which banks ask to borrow.	Parent Class: InterbankRate
InterbankMidRate (interbank mid rate)	Definition: an interbank rate that represents the mid-point between bid and offer rates	Parent Class: InterbankRate
InterbankOfferedRate (interbank offered rate)	Definition: an interbank rate that is the interest rate at which participating banks lend money	Parent Class: InterbankRate
InterbankRate (interbank rate)	Definition: a reference rate that is the rate of interest charged on short-term loans between banks Explanatory note: Banks borrow and lend money in the interbank market in order to manage liquidity and meet the requirements placed on them. The interest rate charged depends on the availability of money in the market, on prevailing rates and on the specific terms of the contract, such as term length.	Parent Class: ReferenceInterestRate
OvernightRate (overnight rate)	Definition: a reference rate that is an interest rate at which a depository institution lends funds to another depository institution (short-term), or the interest rate the central bank charges a financial institution to borrow money overnight Explanatory note: The overnight rate is the lowest available interest rate, and as such, it is only available to the most creditworthy institutions. It is the underlying rate for Overnight Interest Rate Swaps (IOS).	Parent Class: ReferenceInterestRate
ReferenceInterestRate (reference interest rate)	Definition: a market rate that is a rate of interest paid by or agreed among some bank or set of banks Explanatory note: The reference rate is a moving index such as LIBOR, the prime rate or the rate on benchmark U.S. Treasuries.	Parent Class: MarketRate, InterestRate Property Restriction: ∀ **hasReferenceCurrency**.**Currency** (fibo-ind-ir-ir-01)

Properties

Name	Annotations	Property Axioms
hasReferenceCurrency (has reference currency)	Definition: relates a reference rate to the currency it is based on	Parent Property: hasCurrency Domain: ReferenceInterestRate

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		Range: Currency
hasRateResetTimeOfDay (has rate reset time of day)	Definition: a predicate indicating the time of day when the rate is reset e.g., 11:00	Domain: InterbankRate Range: dateTime
hasTenorInDays (has tenor in days)	Definition: a predicate indicating the length of time for which the interbank rate is quoted expressed as a number of days Editorial note: This is given as a whole number representing the number of days, because the concept of a duration is not yet modeled semantically, otherwise this term would refer to duration as its range instead. The name of this property reflects this compromise and would be changed to 'Tenor' once a suitable range exists for this property.	Domain: InterbankRate Range: wholeNumber
hasTenorInMonths (has tenor in months)	Definition: a predicate indicating the length of time for which the interbank rate is quoted, e.g., 3 months, 6 months expressed as a number of months	Domain: InterbankRate Range: wholeNumber

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9.4.2 Ontology: Interest Rate Publishers

This ontology provides concepts descriptive of the publishers of interest rates, such as banks and the bodies which publish inter-bank offer rates.

Issue	FIBOIND-8	Interest rate authority and central bank are misclassified in the Interest Rate Publishers ontology

Table 9.10 Interest Rate Publishers Ontology Metadata

Metadata Term	Value
sm:filename	InterestRatePublishers
sm:fileAbbreviation	fibo-ind-ir-pub
OntologyIRI	http://www.omg.org/spec/EDMC-FIBO/IND/InterestRates/InterestRatePublishers/
owl:versionIRI	http://www.omg.org/spec/EDMC-FIBO/IND/20165085~~0~~01/InterestRates/InterestRatePublishers/
sm:dependsOn	http://www.omg.org/spec/EDMC-FIBO/FND/ http://www.omg.org/spec/EDMC-FIBO/BE/ http://www.omg.org/spec/EDMC-FIBO/FBC/ http://www.omg.org/spec/EDMC-FIBO/IND/Indicators/Indicators/ http://www.omg.org/spec/EDMC-FIBO/IND/InterestRates/InterestRates/

Issue	FIBOIND-8	Interest rate authority and central bank are misclassified in the Interest Rate Publishers ontology

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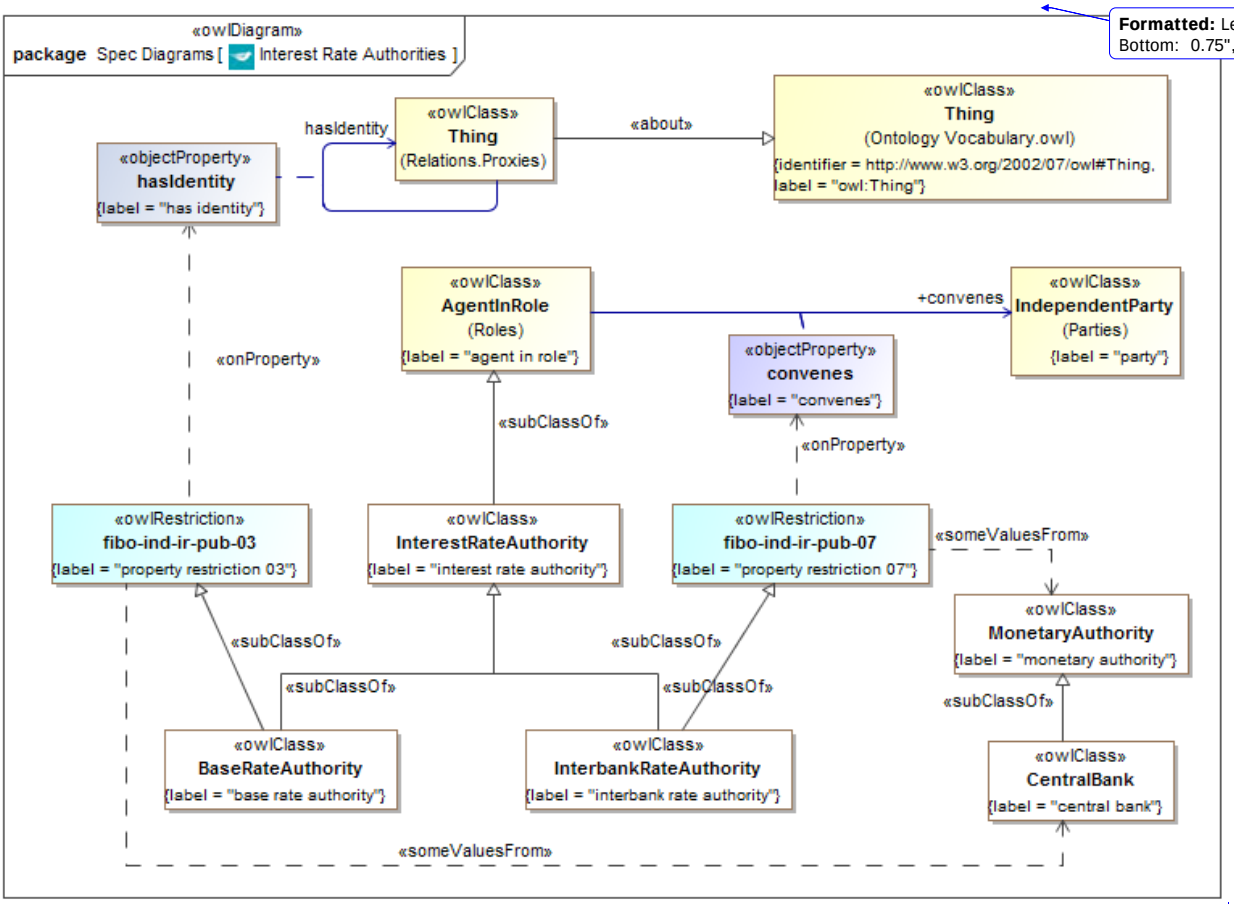

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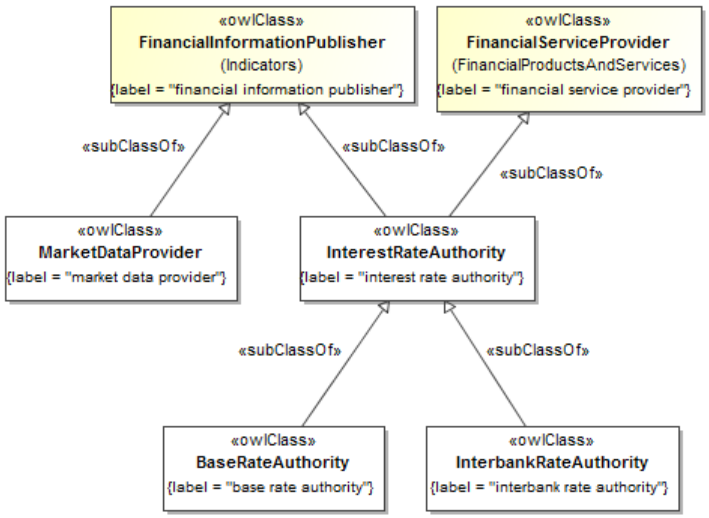
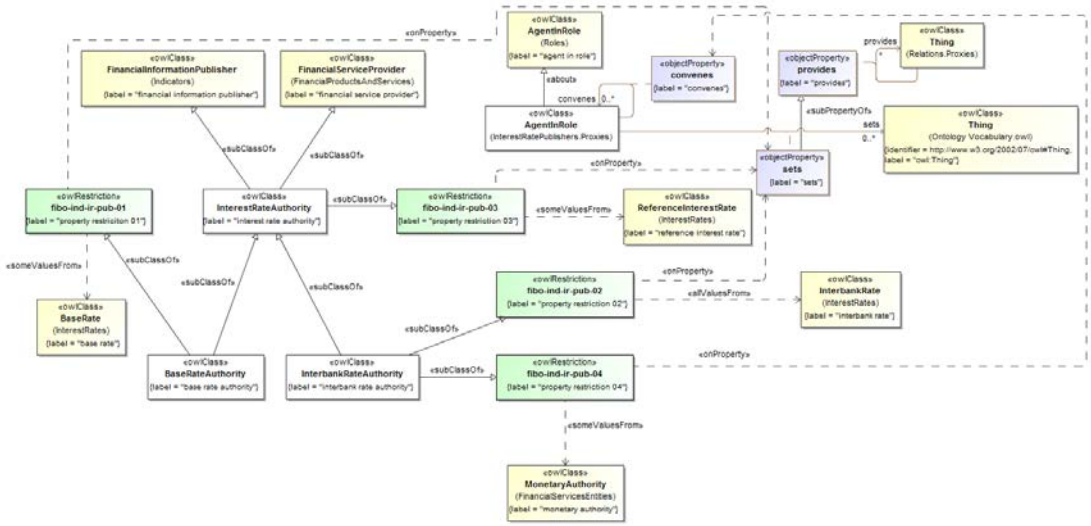


Figure 9.8 Interest Rate Publishers Concepts

Diagram showing the main types of Interest Rate Publishers.



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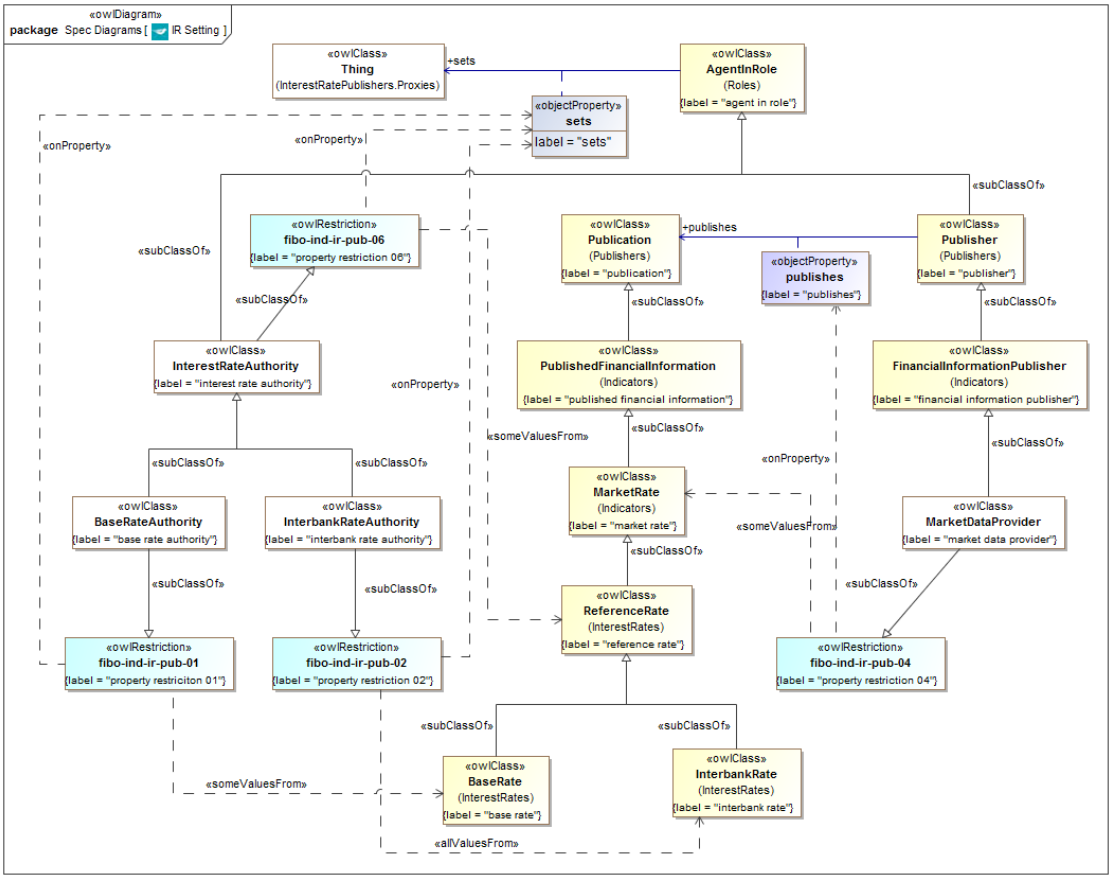

Figure 9.9 **Definition of Interest Rate Authorities~~Interest Rate Setting and Publishing Concepts~~**

~~Diagram showing the above Interest Rate Publishers in terms of what types of rates they set. This diagram also shows the role of the market data provider in publishing rates set by these (for example the LIBOR rate is set by a committee but subsequently published by a specific market data provider).~~

Figure 9.9 shows interest more detail with respect to the definitions of the various interest rate authorities relevant to FIBO, including restrictions defining the scope of the rates they set.

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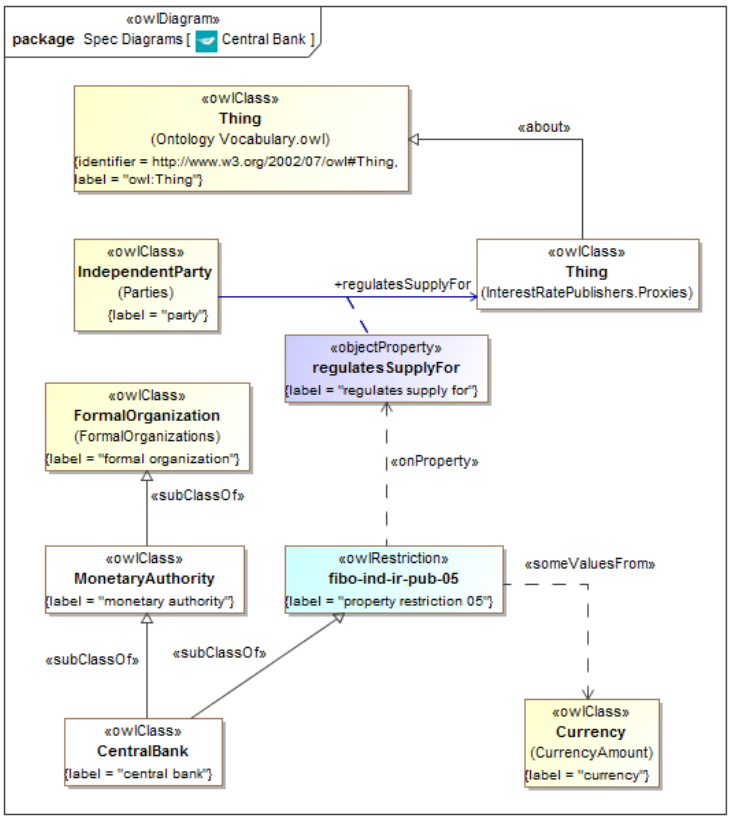

~~Figure 9.10 Interest Rate Publishers Central Bank Concepts~~

~~Diagram showing the concept of a central bank.~~

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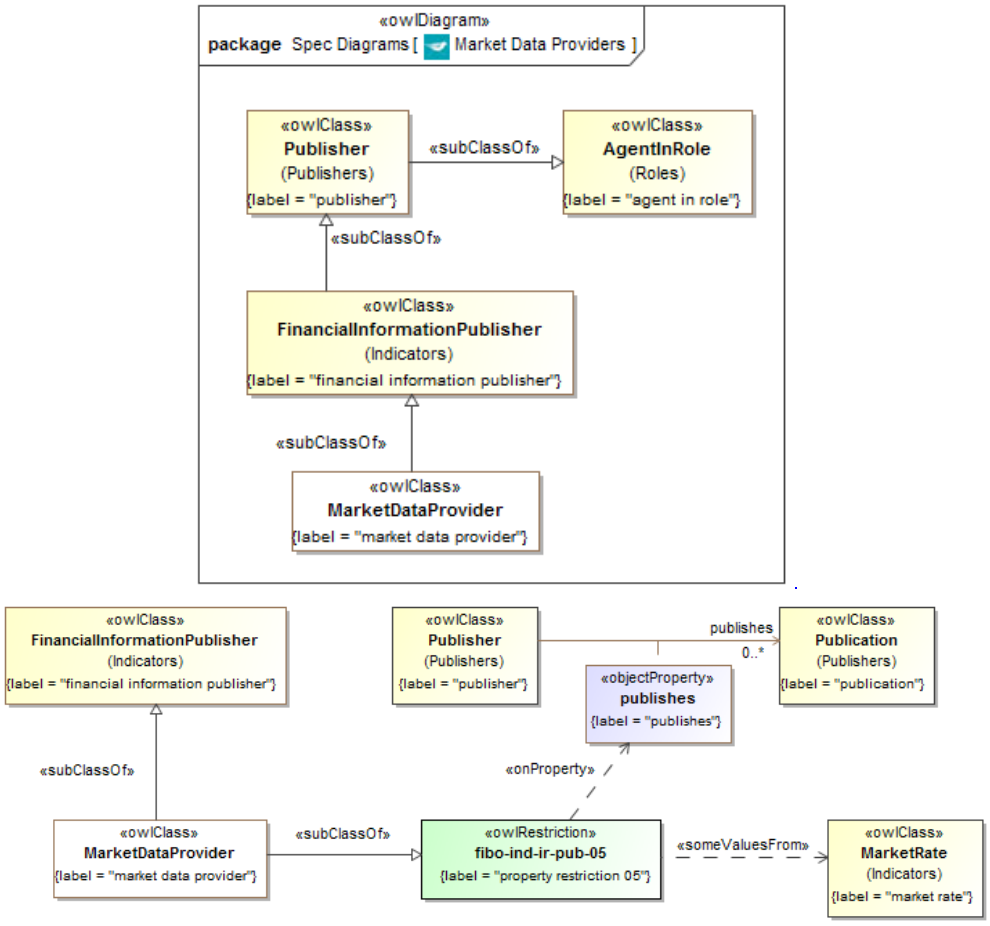

Figure 9.~~11~~10 Definition of Market Data Provider~~Interest Rate Publishers Market Data Provider~~

Figure 9.10 depicts a market data provider as a financial information publisher that publishes market rates.~~Diagram showing the concept of a market data provider.~~

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Table 9.11 Interest Rate Publishers Ontology Details

Classes

Name	Label	definition	parent	explanatoryNote
BaseRateAuthority	base rate authority	an interest rate authority responsible for setting the base rate for a given currency, typically a central bank	interest rate authority property restriction 01 property restriction 03	
CentralBank	central bank	a monetary authority or institution that is a bank and that manages the currency, money supply, and interest rates for a state or group of states which share a currency	property restriction 05 monetary authority	
InterbankRateAuthority	interbank rate authority	an interest rate authority responsible for setting the Interbank rate	interest rate authority property restriction 02 property restriction 07	This is announced by the relevant Central Bank at intervals following a meeting of the relevant policy group or committee. Thomson Reuters is the publisher for LIBOR, but this is set by the British Bankers Association (BBA).
InterestRateAuthority	interest rate authority	an authority responsible for the publication of some interest rate	agent in role property restriction 06	Interest rates which are referred to as market rates, for example as used in interest rate derivatives, are published by some authority responsible for the rate as a kind of market data.
MarketDataProvider	market data provider	a publisher that publishes data about the financial markets.	property restriction 04 financial information publisher	
MonetaryAuthority	monetary authority	a formal organization that controls the monetary policy, regulation and supply of money in some country or group of countries	formal organization	

Properties

Name	Label	Domain	Range	Definition	Parent
convenes	convenes	agent in role	party	a predicate indicating that someone acting in the role of convenor brings together some number of individuals for a meeting or conference; assembles; makes arrangements for a meeting to take place	

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regulatesSupplyFor	regulates supply for	party	Thing	a predicate indicating that someone controls or supervises the amount of something available in some market by means of rules and regulations	governs
sets	sets	agent in role	Thing	a predicate indicating that someone places something in some relationship to something or someone else	provides

Restrictions

Name	Label	Expressions
fibo-ind-ir-pub-01	property restriction 01	sets some BaseRate
fibo-ind-ir-pub-02	property restriction 02	sets only InterbankRate
fibo-ind-ir-pub-03	property restriction 03	hasIdentity some CentralBank
fibo-ind-ir-pub-04	property restriction 04	publishes some MarketRate
fibo-ind-ir-pub-05	property restriction 05	regulatesSupplyFor some Currency
fibo-ind-ir-pub-06	property restriction 06	sets some ReferenceRate
fibo-ind-ir-pub-07	property restriction 07	convenes some MonetaryAuthority

Issue	FIBOIND-28	Correct typo in the properties section of Table 9.11, Interest Rate Publishers Ontology Details for the property "sets"

Classes

Name	Annotations	Class Expressions
BaseRateAuthority (base rate authority)	Definition: an interest rate authority responsible for setting the base rate for a given currency, typically a central bank	Parent Class: InterestRateAuthority Property Restriction: ∃ **sets**.**BaseRate** (fibo-ind-ir-pub-01)
InterbankRateAuthority (interbank rate authority)	Definition: an interest rate authority responsible for setting the interbank rate Explanatory note: This is announced by the relevant central bank or other authority at intervals following a meeting of the relevant policy group or committee.	Parent Class: InterestRateAuthority Property Restriction: ∀ **sets**.**InterbankRate** (fibo-ind-ir-pub-02) Property Restriction: ∃ **convenes**.**MonetaryAuthority** (fibo-ind-ir-pub-04)
InterestRateAuthority (interest rate authority)	Definition: an authority responsible for the publication of some interest rate	Parent Class: FinancialInformationPublisher,

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	Explanatory note: Interest rates which are referred to as market rates, for example as used in interest rate derivatives, are published by some authority responsible for the rate as a kind of market data. Example: This is typically a bank, central bank in the case of the publication of bank interest rates, or the committee responsible for publishing interbank rates, such as LIBOR.	FinancialServiceProvider Property Restriction: ∃ **sets**.**ReferenceInterestRate** (fibo-ind-ir-pub-03)
MarketDataProvider (market data provider)	Definition: a publisher that publishes data about the financial markets	Parent Class: FinancialInformationPublisher Property Restriction: ∃ **publishes**.**MarketRate** (fibo-ind-ir-pub-05)

Properties

Name	Annotations	Property Axioms
convenes (convenes)	Definition: a predicate indicating that someone acting in the role of convenor brings together some number of parties for a meeting or conference; assembles; makes arrangements for a meeting to take place	Domain: AgentInRole Range: AgentInRole
sets (sets)	Definition: a predicate indicating that some party places something in some relationship to something or someone else Example: The interest rate authority (such as a central bank or monetary authority or a panel working behalf of such) determines and sets the reference rate which is in force at a given time.	Parent Property: provides Domain: AgentInRole

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9.5 Module: Economic Indicators

Table 9.12 Economic Indicators Module Metadata

Metadata Term	Value
sm:moduleName	EconomicIndicators
sm:moduleAbbreviation	FIBO-IND-EI
sm:moduleVersion	1.0
sm:moduleAbstract	This module includes ontologies defining concepts to do with published economic indicators. These give some indication of the state of some economy. Indicators of this type are usually published by governments or government agencies, or by international agencies or agencies of countries other than the ones reported on. Examples include Gross Domestic Product (GDP) and unemployment rates.

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9.5.1 Ontology: Economic Indicators

This ontology provides the parameters which make up the various types of market economic indicators, along with basic facts about these such as the economies or countries they apply to.

Issue	FIBOIND-24	Need a better representation for general economic indicators

Table 9.13 Economic Indicators Ontology Metadata

Metadata Term	Value
sm:filename	EconomicIndicators
sm:fileAbbreviation	fibo-ind-ei-ei
OntologyIRI	http://www.omg.org/spec/EDMC-FIBO/IND/EconomicIndicators/EconomicIndicators/
owl:versionIRI	http://www.omg.org/spec/EDMC-FIBO/IND/20165085501/EconomicIndicators/EconomicIndicators/
sm:dependsOn	http://www.omg.org/spec/EDMC-FIBO/FND/ http://www.omg.org/spec/EDMC-FIBO/BE/

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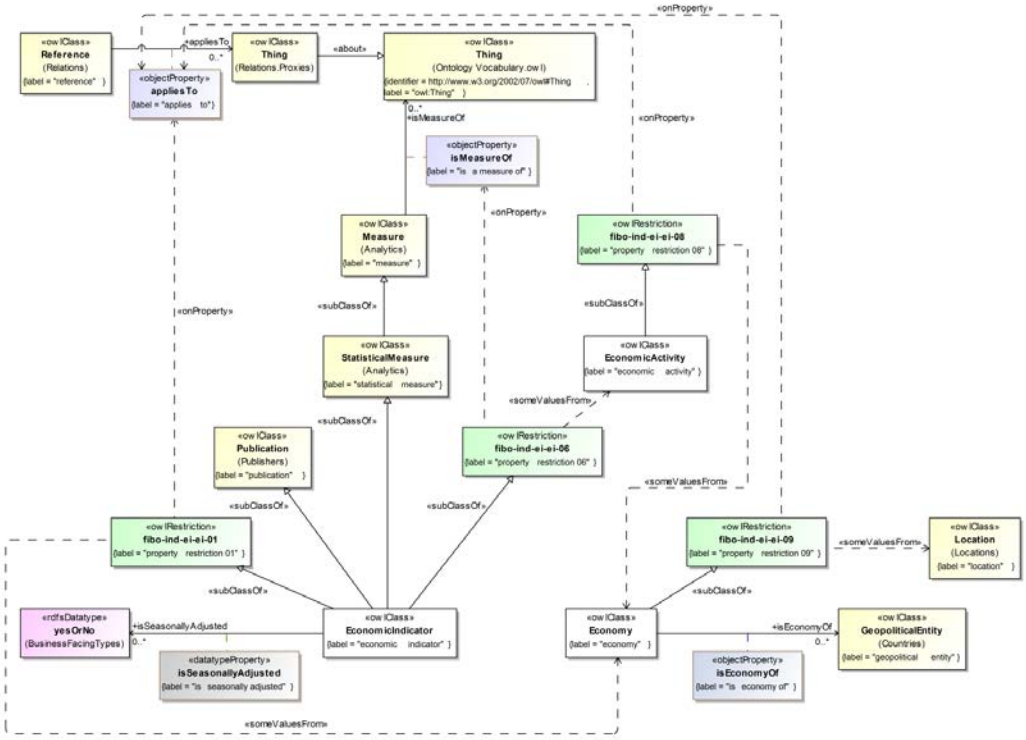

~~Figure 9.12 Economic Indicators Common Concepts~~

~~Diagram showing all the concepts common to economic indicators in the Economic Indicators ontology.~~

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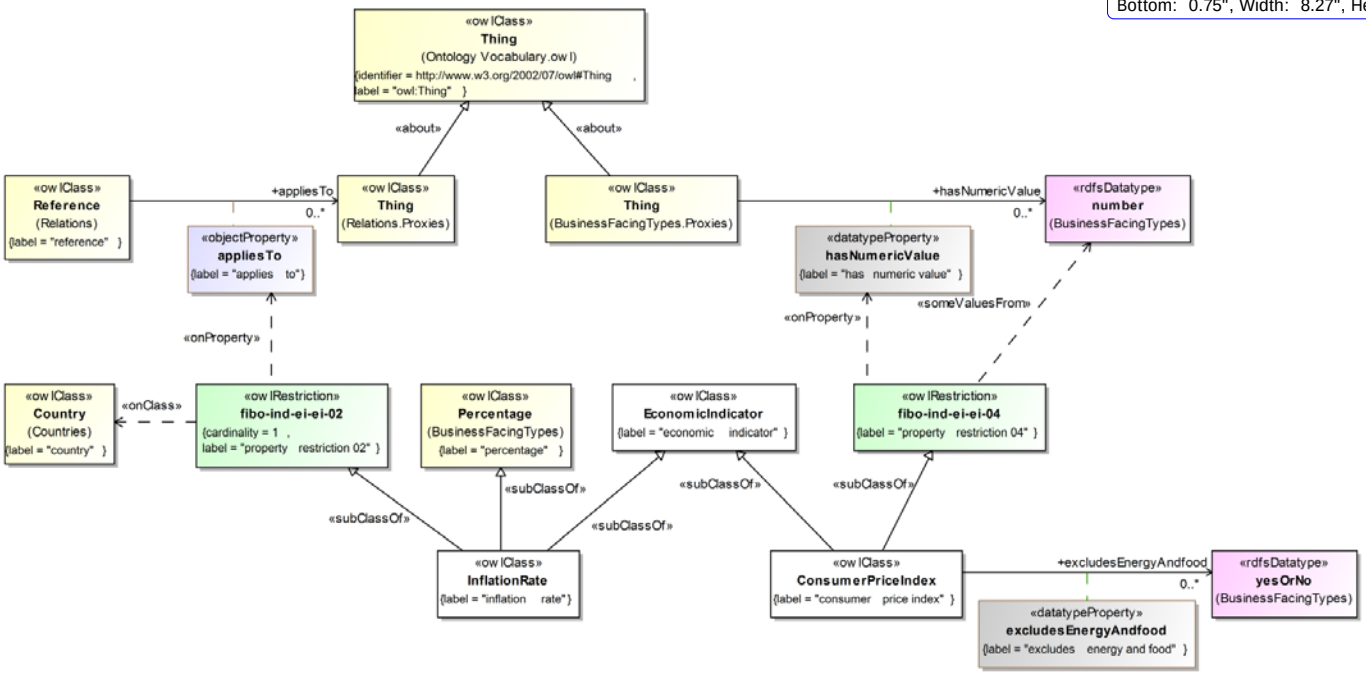

Figure 9.13 Economic Indicators Inflation Measures

Diagram showing inflation measures concepts in the Economic Indicators ontology.

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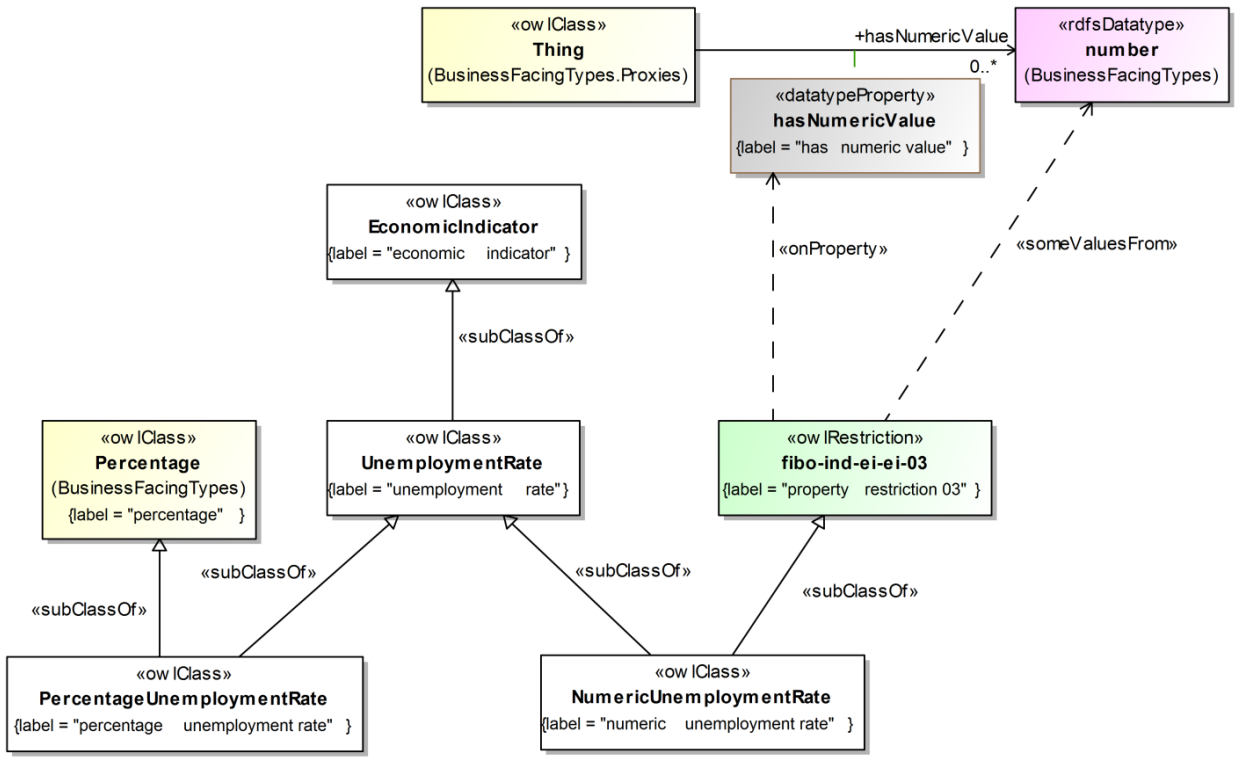

~~**Figure 9.14 Economic Indicators Unemployment Statistics**~~

~~Diagram showing unemployment index concepts in the Economic Indicators ontology.~~

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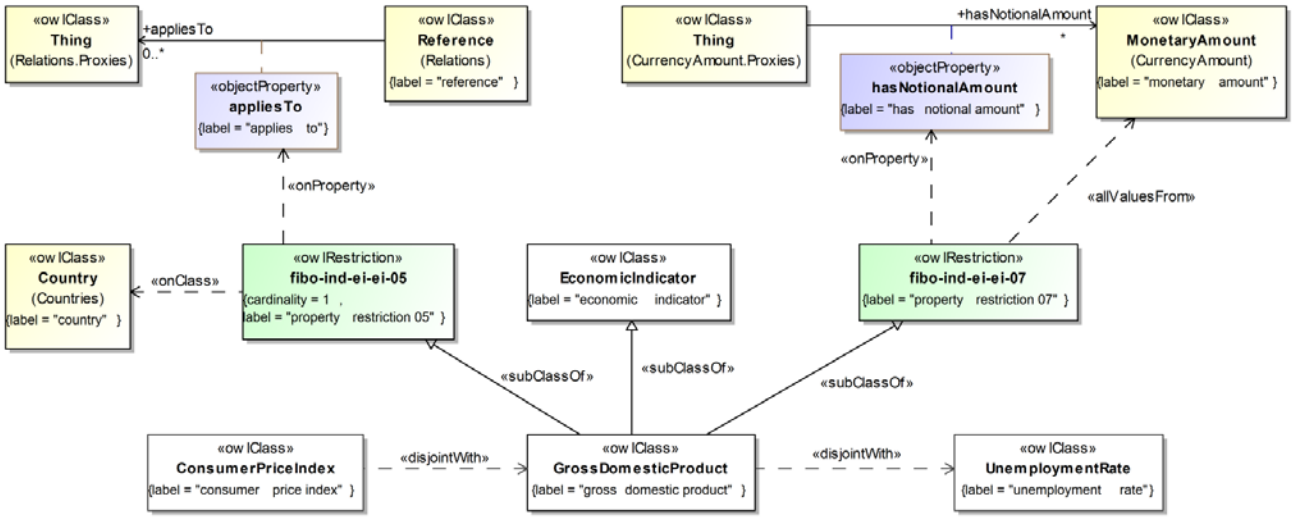

~~Figure 9.15 Economic Indicators Gross Domestic Product~~

~~Diagram showing GDP concepts in the Economic Indicators ontology.~~

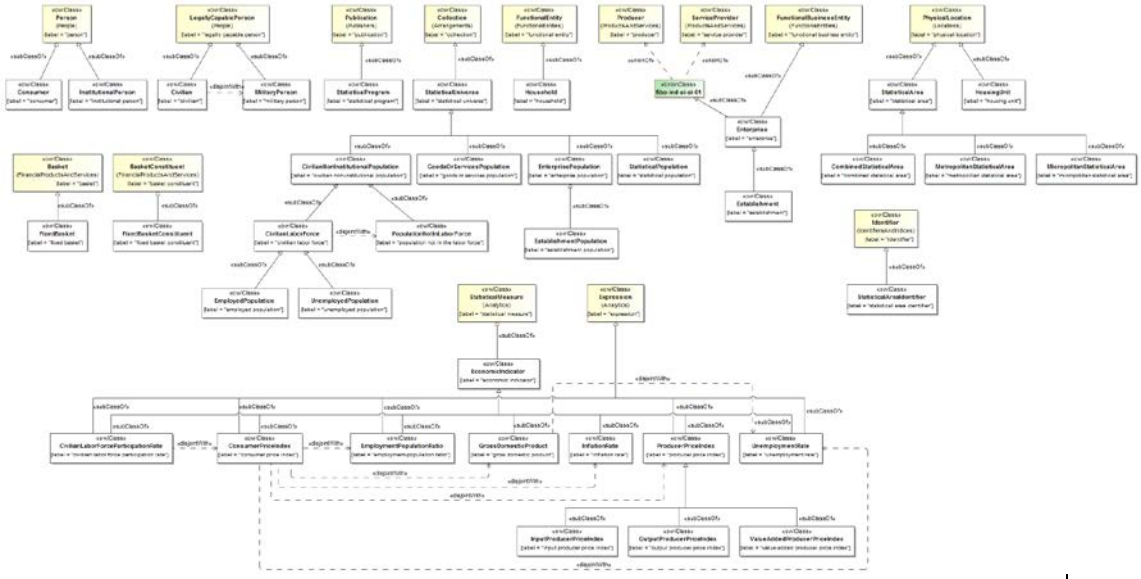

Figure 9.12 Economic Indicators Class Hierarchy

Figure 9.12 provides an overview of the concepts in the economic indicators ontology, including statistical areas, statistical programs, universes, and populations, contexts for various programs and universes, such as consumers, households, and establishments, and a number of leading economic indicators.

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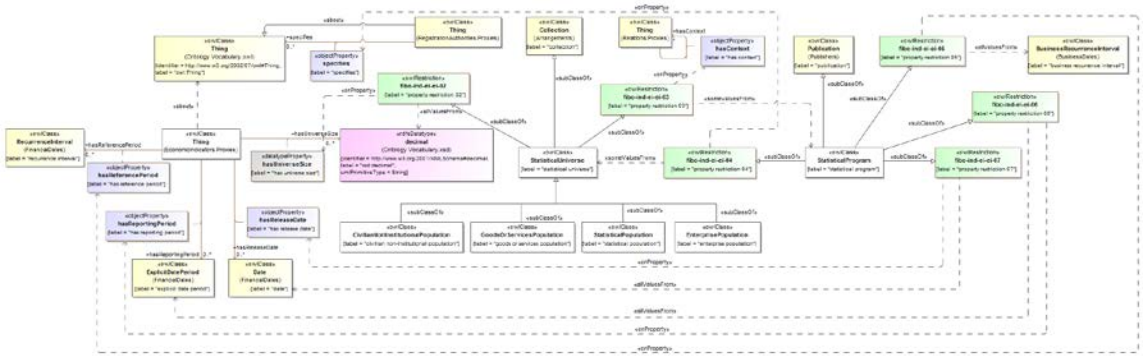

Figure 9.13 Statistical Programs and Universes

Figure 9.13 defines the general purpose concepts for statistical programs and universes, used as the basis for defining the context of for economic indicators in this specification.

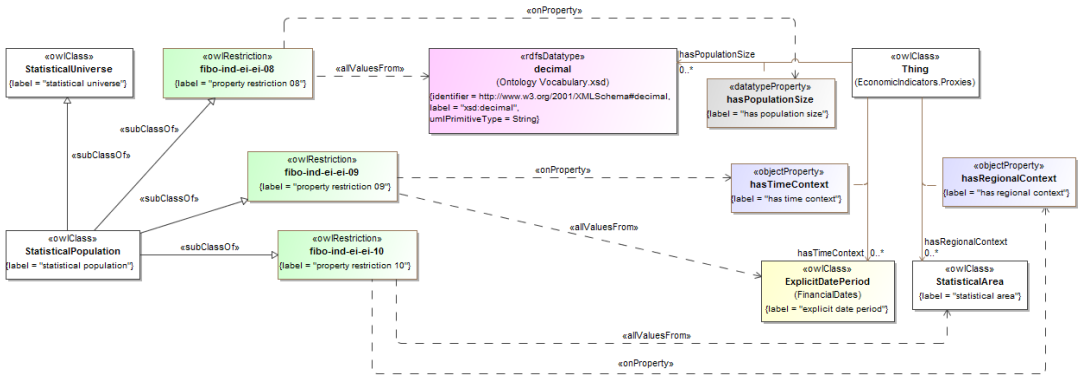

Figure 9.14 Definition of Statistical Population

A statistical population is a statistical universe that has a population size, covers an explicit period of time and is specific to a statistical area, as shown in Figure 9.14.

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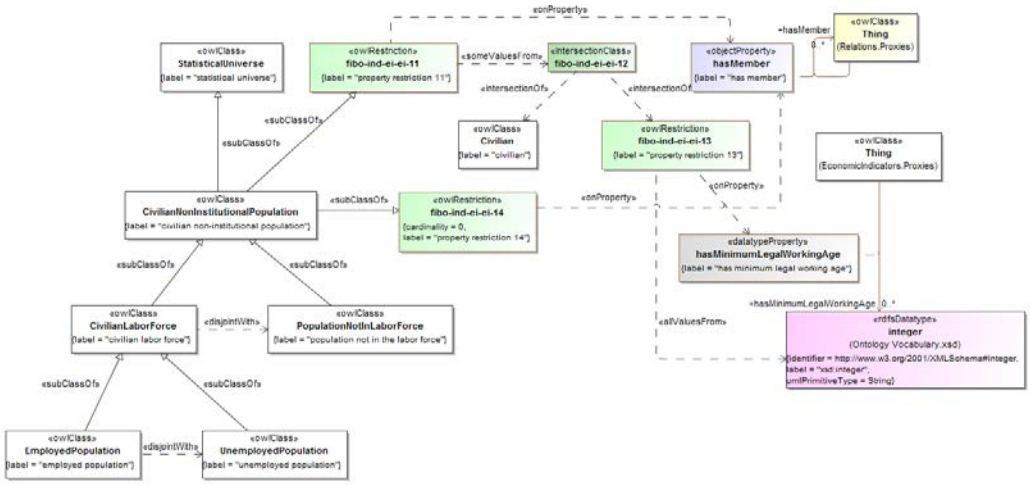

Figure 9.15 Definition of Civilian Non-Institutional Population

Figure 9.15 depicts the definition of one of the more important statistical universes for the economic indicators defined herein. This population consists of people that are not on active military duty and that do not live in institutions, including mental health facilities, rehabilitation and long term care facilities, prisons, and so forth. Employment and unemployment figures and consumer price indices use this statistical universe as the basis for surveys.

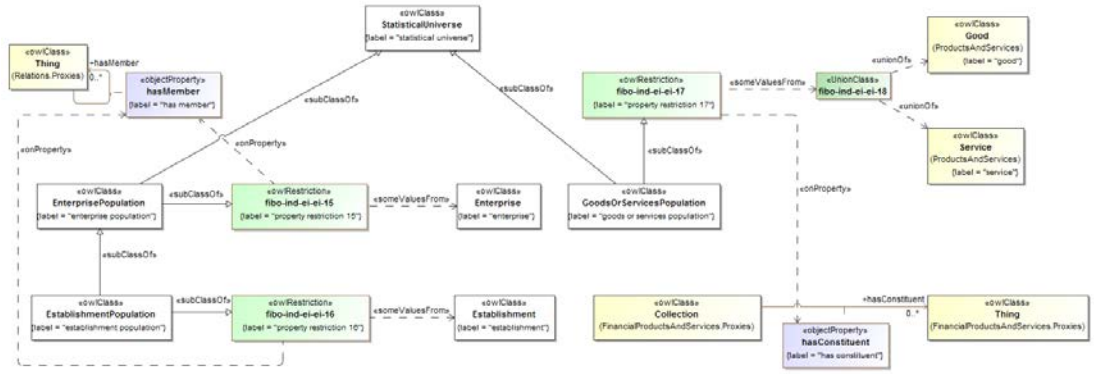

Figure 9.16 Definition of Establishment, Enterprise, and Goods and Services Populations

The populations shown in Figure 9.16 are also used as the basis for certain employment and price indices surveys.

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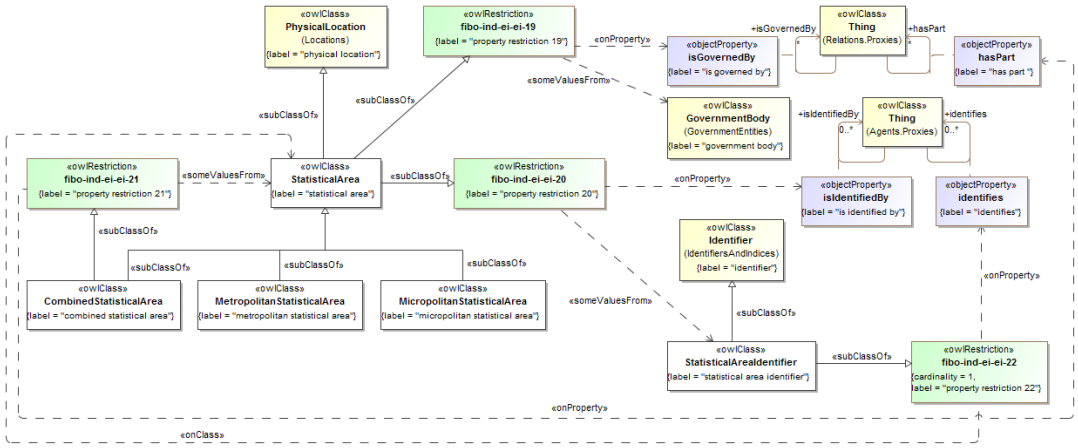

Figure 9.17 Definition of Statistical Area

Every economic indicator is defined with respect to a statistical area, which may be a broad region such as the European Union, an individual country, a region, province, state, or smaller area within a country, or an area around or including one or more cities, as in a metropolitan statistical area, micropolitan statistical area, or combined statistical area, as shown in Figure 9.17.

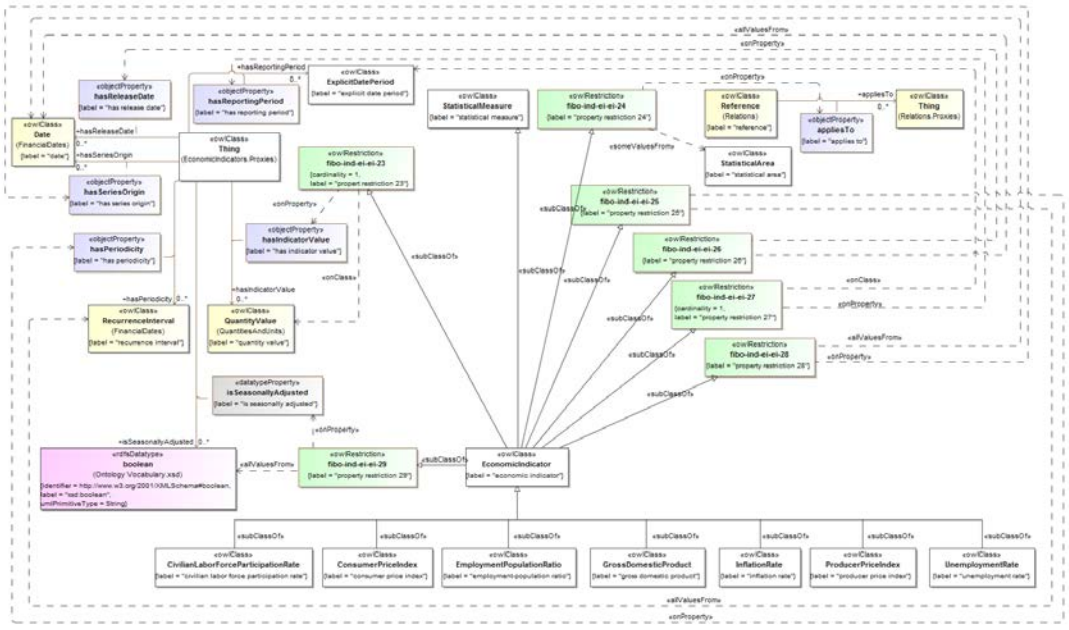

Figure 9.18 Definition of an Economic Indicator

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Figure 9.18 shows the definition of a basic economic indicator, which has a value, applies to some statistical area, has a series origin, periodicity, release date, covers a specific reporting period, and may or may not be seasonally adjusted.

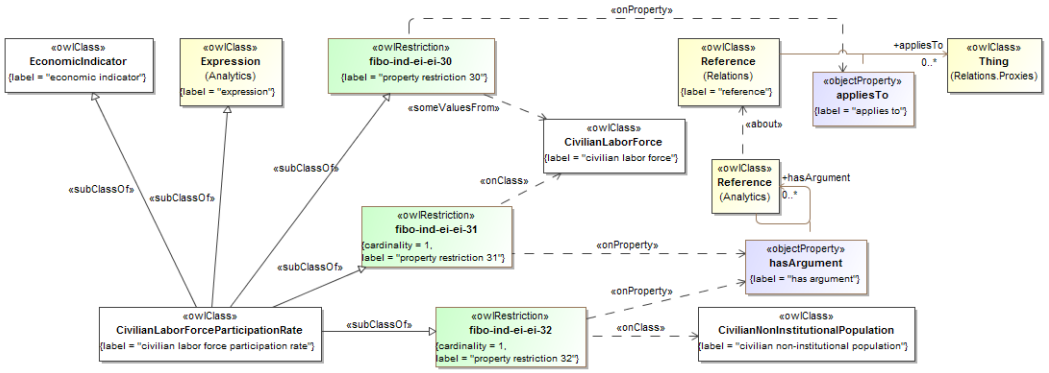

Figure 9.19 Definition of the Civilian Labor Force Participation Rate

Figure 9.19 shows the definition of the civilian labor force participation rate, a critical component of employment and unemployment indicators that identifies the rate of participation of members of the civilian non-institutional population. Note that although there are variations from country to country, after an individual has been out of work for a short period of time, and have not actively sought employment also for a short period of time, they are no longer counted as a part of the population.

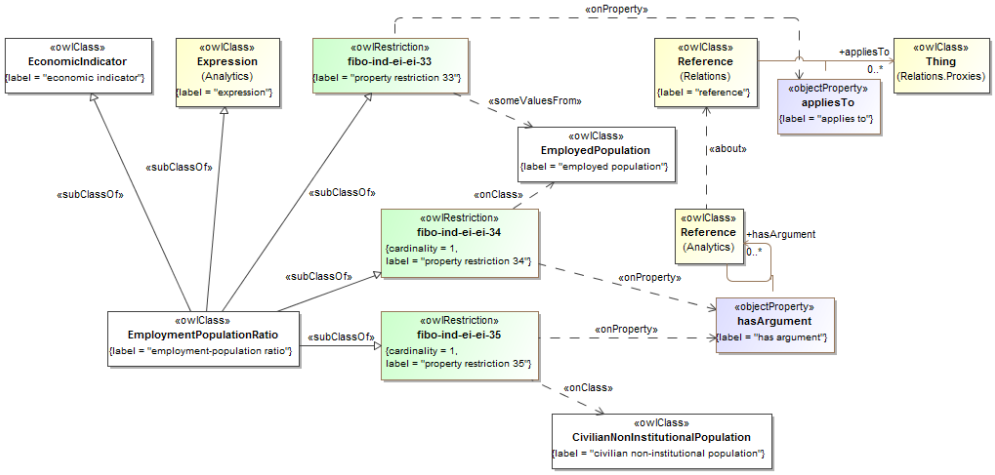

Figure 9.20 Definition of the Employment Population Ratio

Figure 9.20 shows the definition of the employment population ratio, an employment indicator that represents the ratio of the employed population to the overall civilian non-institutional population.

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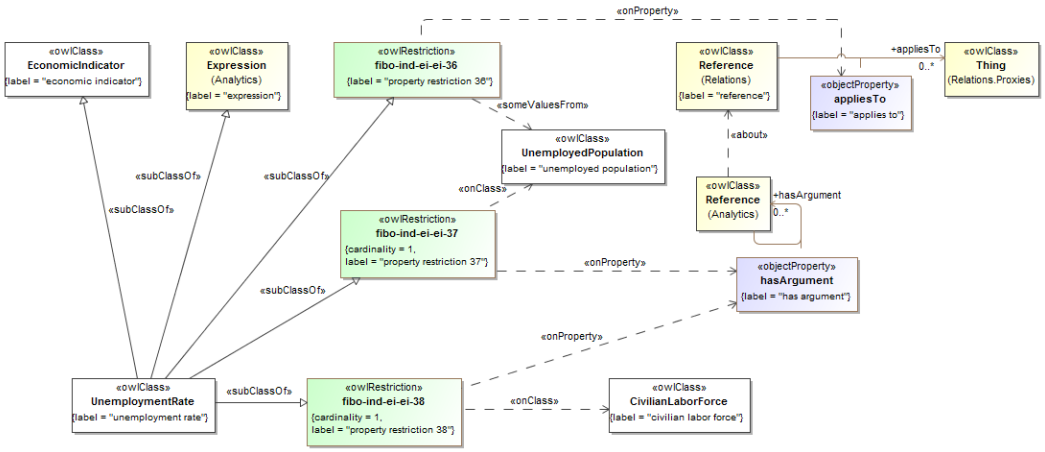

Figure 9.21 Definition of the Unemployment Rate

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Figure 9.21 shows the definition of the unemployment rate, an employment indicator that represents the ratio of the unemployed population to the civilian labor force (rather than to the overall civilian non-institutional population, which is what many people assume).

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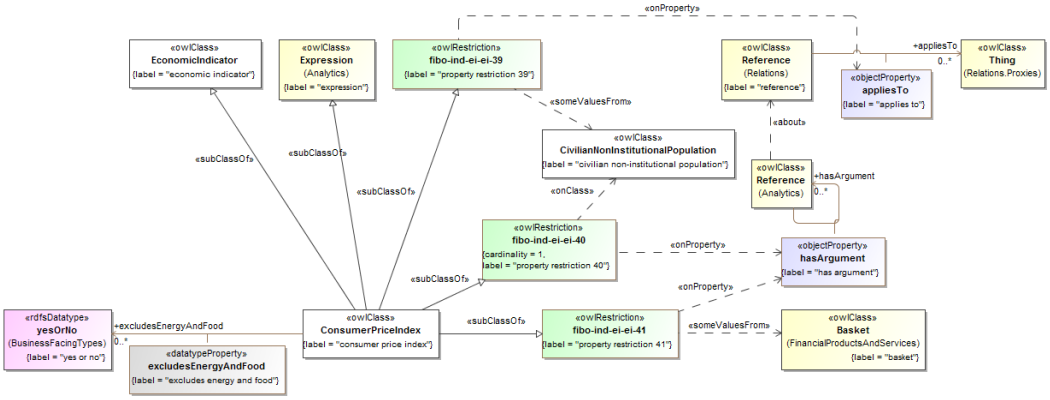

Figure 9.22 Definition of Consumer Price Index (CPI)

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Figure 9.22 depicts the definition of the consumer price index (CPI), an economic indicator representing a measure of the change over time in the prices of consumer goods and services that households consume.

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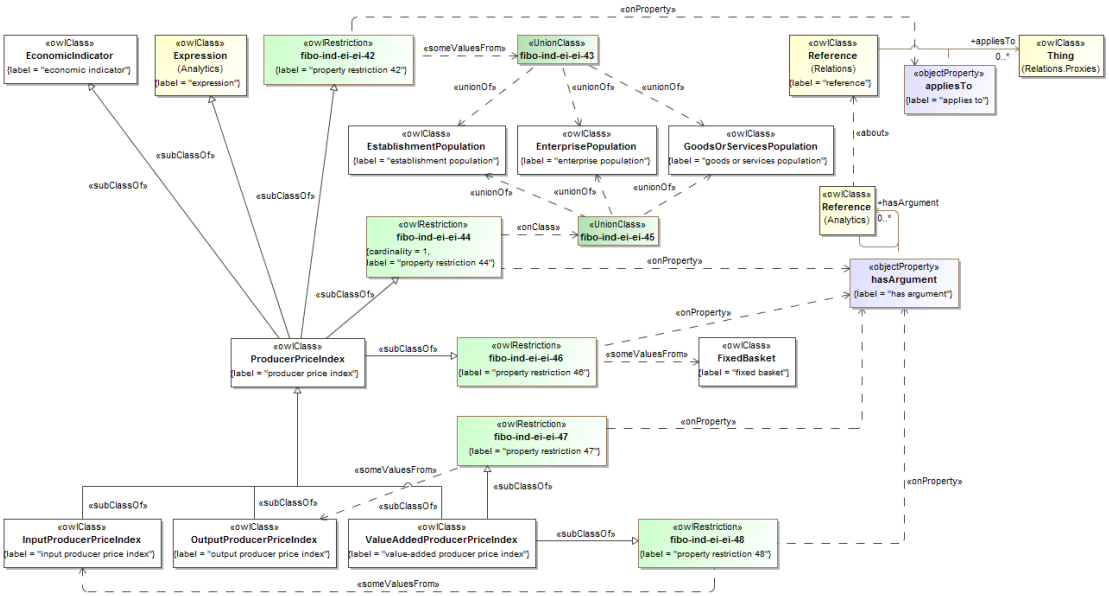

Figure 9.23 Definition of Producer Price Index (PPI)

Figure 9.23 presents the definition of the producer price index (PPI), an economic indicator representing a measure of the rate of change over time in the prices of goods and services bought and sold by producers.

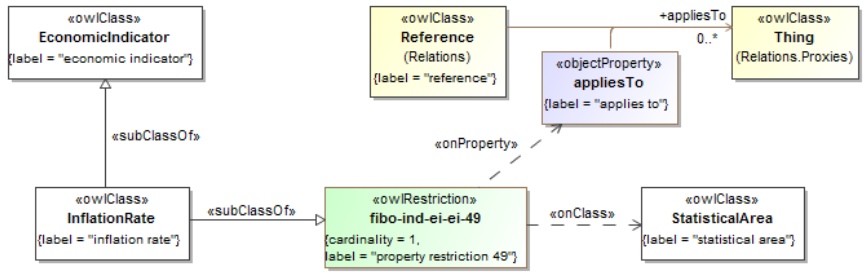

Figure 9.24 Definition of Inflation Rate

Figure 9.24 presents the definition of inflation rate, an economic indicator representing a change in prices of goods and services for a specified period, for a given statistical area.

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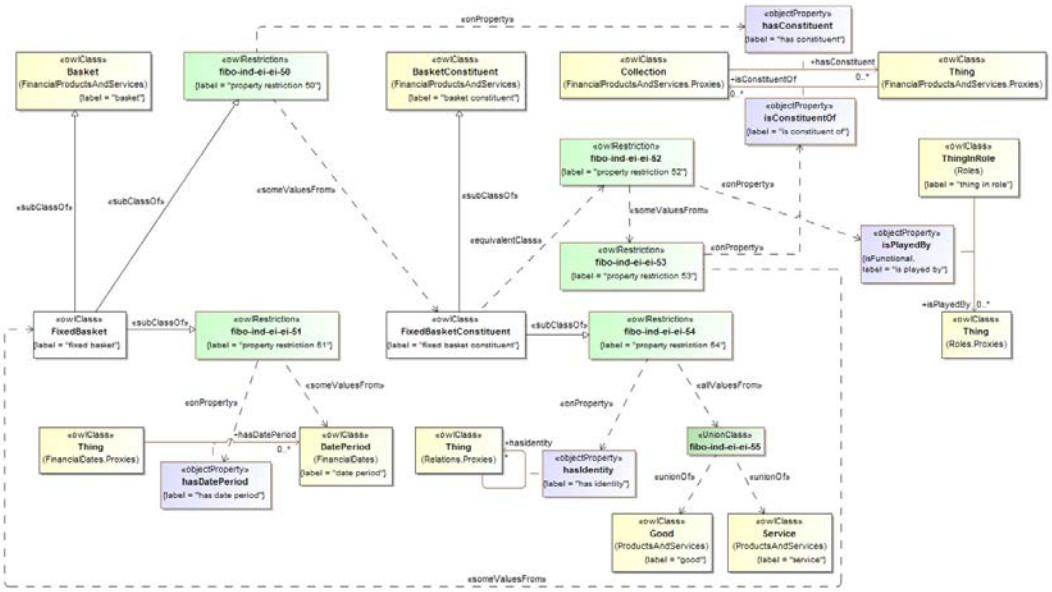

Figure 9.25 Definition of Fixed Basket and Fixed Basket Constituent

Figure 9.25 provides the definition of a fixed basket, which is a basket of goods and services whose quantity and quality are held fixed for some period of time, used as the basis for calculating price indices.

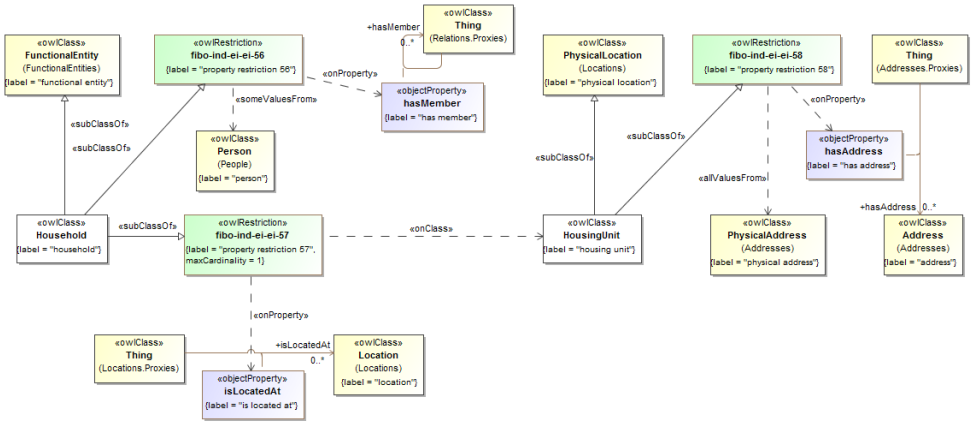

Figure 9.26 Definition of Household and Housing Unit

Households, which are the target of certain employment and pricing surveys, are defined in Figure 9.26.

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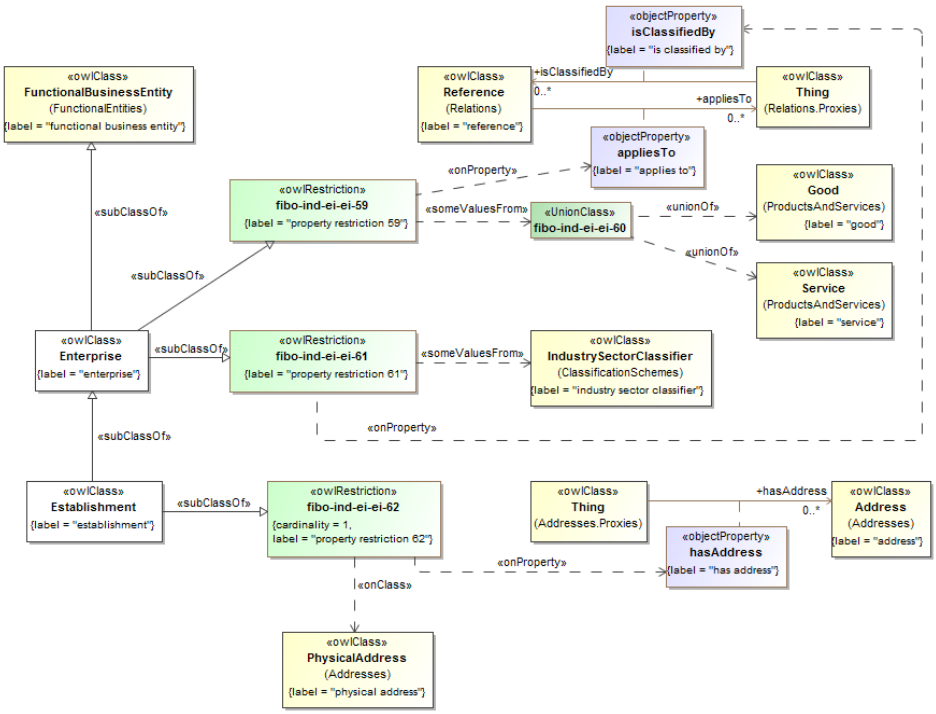

Figure 9.27 Definition of Enterprise and Establishment

Enterprises, which are also the target of certain employment and pricing surveys, are defined in Figure 9.27. The difference between an enterprise and an establishment is that an establishment has exactly one address, whereas an enterprise may have multiple locations.

Table 9.14 Economic Indicators Ontology Details

~~**Classes**~~

~~**Name**~~	~~**Label**~~	~~**Definition**~~	~~**Parent**~~	~~**Disjoint with**~~	~~**Explanatory Note**~~	~~**Definition Source**~~
~~ConsumerPriceIndex~~	~~consumer price index, CPI~~	~~an economic indicator representing a measure of the average change over time in the prices paid by urban consumers for a market basket of consumer goods and services~~	~~economic indicator property restriction 04~~	~~gross domestic product~~		~~http://stats.bls.gov/cpi/cpifaq.htm#Question_1~~

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Name	Label	Definition	Parent	Disjoint with	Explanatory Note	Definition Source
EconomicActivity	economic activity	an aspect of the behavior of some economic actor in an economy, related to the production, distribution, and consumption of goods and services	property restriction 08			
EconomicIndicator	economic indicator	a statistical measure of an economic activity, used for analysis of economic performance and predictions of future performance	property restriction 01 property restriction 06 statistical measure publication			
Economy	economy, economic system	An economy consists of the production, distribution or trade, and consumption of limited goods and services by different economic actors in a given geographically distinct web of relationships.	property restriction 09			
GrossDomestic Product	gross domestic product	an economic indicator representing the broadest measure of aggregate economic activity, measuring the total value of all final goods and services produced within a country's borders during a specific period	property restriction 07 economic indicator property restriction 05	unemployment rate		http://www.treasury.gov/initiatives/ofr/about/Documents/AR2013_Back_Matter_Glossary+Bib_Refs+Endnotes.pdf
InflationRate	inflation rate	an economic indicator representing a percent change in consumer prices for a specified, typically a one-year, period, for a given country	property restriction 02 economic indicator percentage			
Numeric UnemploymentRate	numeric unemployment rate	an economic indicator representing the number of unemployed in the labor force of a given economy for some specified period	property restriction 03 unemployment rate			

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Name	Label	Definition	Parent	Disjoint with	Explanatory Note	Definition Source
PercentageUnemploymentRate	percentage unemployment rate	an economic indicator representing the ratio of unemployment to the labor force of a given economy for some specified period expressed in percentage terms	unemployment rate, percentage			
UnemploymentRate	unemployment rate	an economic indicator representing the level of unemployment to the labor force of a given economy for some specified period	economic indicator		Persons are classified as unemployed if they do not have a job, have actively looked for work in the prior 4 weeks, and are currently available for work. Workers expecting to be recalled from layoff are counted as unemployed, whether or not they have engaged in a specific jobseeking activity. In all other cases, the individual must have been engaged in at least one active job search activity in the 4 weeks preceding the interview and be available for work (except for temporary illness).	

Properties

Name	Label	Domain	Range	Definition		Explanatory Note
excludesEnergyAndfood	excludes energy and food	consumer price index	yes or no	a predicate indicating whether the index excludes energy and food prices		
isEconomyOf	is economy of	economy	geopolitical entity	a predicate relating an economy to the geopolitical entity it refers to		
isSeasonallyAdjusted	is seasonally adjusted	economic indicator	yes or no	a predicate indicating whether some published formal method is applied that	Example explanation from the US Bureau of Labor and Statistics: Because price data are used for different purposes by different groups, the Bureau of Labor Statistics publishes seasonally adjusted as	

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Name	Label	Domain	Range	Definition	Explanatory Note
				compensates for seasonal variations in the index value	well as unadjusted changes each month. ... Seasonal factors used in computing the seasonally adjusted indexes are derived by the X-13ARIMA-SEATS Seasonal Adjustment Method. Seasonally adjusted indexes and seasonal factors are computed annually. Each year, the last five years of seasonally adjusted data are revised.

Restrictions

Name	Label	Expressions
fibo-ind-ei-ei-01	property restriction 01	appliesTo some Economy
fibo-ind-ei-ei-02	property restriction 02	appliesTo exactly 1 Country
fibo-ind-ei-ei-03	property restriction 03	hasNumericValue some number
fibo-ind-ei-ei-04	property restriction 04	hasNumericValue some number
fibo-ind-ei-ei-05	property restriction 05	appliesTo exactly 1 Country
fibo-ind-ei-ei-06	property restriction 06	isMeasureOf some EconomicActivity
fibo-ind-ei-ei-07	property restriction 07	hasNotionalValue only MonetaryAmount
fibo-ind-ei-ei-08	property restriction 08	appliesTo some Economy
fibo-ind-ei-ei-09	property restriction 09	appliesTo some Location

Classes

Name	Annotations	Class Expressions
Civilian (civilian)	Definition: a person that is not a member of the military (*i.e.*, that is not on active duty) Adapted from: U.S. Bureau of Labor Statistics and Statistics Canada reference definitions - https://wiki.edmcouncil.org/pages/viewpage.action?pageId=6358041	Parent Class: LegallyCapablePerson
CivilianLaborForce (civilian labor force)	Definition: a subset of the civilian, non-institutional population considered to be part of the labor force during a given reporting period Adapted from: U.S. Bureau of Labor Statistics and Statistics Canada reference definitions - https://wiki.edmcouncil.org/pages/viewpage.action?pageId=6358041	Parent Class: CivilianNonInstitutionalPopulation Class Axiom: ¬ PopulationNotInLaborForce
CivilianLaborForcePartricipationRate (civilian labor force participation rate)	Definition: an economic indicator representing the rate of participation the labor force of a given economy for some specified period Actual expression: civilian labor force ÷ civilian non-institutional population Explanatory note: The labor force participation rate is the percentage of the population that is either employed or unemployed (that is, either working or actively seeking work).	Parent Class: EconomicIndicator, Expression Property Restriction: ∃ **appliesTo**.**CivilianLaborForce** (fibo-ind-ei-ei-30) Property Restriction: = 1 **hasArgument**.**CivilianLaborForce** (fibo-ind-ei-ei-31)

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	Adapted from: http://www.bls.gov/bls/cps_fact_sheets/lfp_mock.htm	Property Restriction: = 1 **hasArgument**.**CivilianNonInstitutionalPopulation** (fibo-ind-ei-ei-32)
CivilianNonInstitutionalPopulation (civilian non-institutional population)	Definition: a statistical universe consisting of people of a certain age who reside in a given region, do not live in institutions (for example, correctional facilities, long-term care hospitals, and nursing homes), and are not on active military duty Scope note: The civilian non-institutional population is typically reported in thousands. Adapted from: U.S. Bureau of Labor Statistics and Statistics Canada reference definitions - https://wiki.edmcouncil.org/pages/viewpage.action?pageId=6358041	Parent Class: StatisticalUniverse Property Restriction: ∃ **hasMember** (Civilian ∩ (∀ **hasMinimumLegalWorkingAge.integer**)) (fibo-ind-ei-ei-11, fibo-ind-ei-ei-12, fibo-ind-ei-ei-13) Property Restriction: = 0 **hasMember**.**InstitutionalPerson** (fibo-ind-ei-ei-14)
CombinedStatisticalArea (combined statistical area, CSA)	Definition: a combination of adjacent metropolitan and micropolitan areas with economic ties measured by commuting patterns Explanatory note: These areas that combine retain their own designations as metropolitan or micropolitan statistical areas within the larger combined statistical area. Adapted from: https://en.wikipedia.org/wiki/Combined_statistical_area Adapted from: https://www.census.gov/population/metro/ Adapted from: https://www.whitehouse.gov/sites/default/files/omb/assets/fedreg_2010/06282010_metro_standards-Complete.pdf	Parent Class: StatisticalArea Property Restriction: ∃ **hasPart**.**StatisticalArea** (fibo-ind-ei-ei-21)
Consumer (consumer)	Definition: a person that is the ultimate user of a product or service Explanatory note: The consumer is not always the purchaser of the product. Consumers are considered to be the users of the final product. For example, purchasers of building products are interim users of these products while constructing the finished product, which then may be purchased by the consumer. Explanatory note: For the purposes of the CPI, the definition of consumer is limited to humans. In general, a consumer could include a pet, as the consumer of pet food, for example, although the pet owner would likely be the purchaser and target of advertising. Adapted from: Barron's Dictionary of Business and Economics Terms, Fifth Edition, 2012	Parent Class: Person
ConsumerPriceIndex (consumer price index, CPI)	Definition: an economic indicator representing a measure of the change over time in the prices of consumer goods and services that households consume Adapted from: http://www.ilo.org/public/english/bureau/stat/guides/cpi/ Adapted from: http://unstats.un.org/unsd/nationalaccount/docs/SNA2008.pdf	Parent Class: EconomicIndicator, Expression Property Restriction: ∃ **appliesTo**.**CivilianNonInstitutionalPopulation** (fibo-ind-ei-ei-39) Property Restriction: = 1 **hasArgument**.**CivilianNonInstitutionalPopulation** (fibo-ind-ei-ei-40) Property Restriction: = 1

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		hasArgument.**Basket** (fibo-ind-ei-ei-41) Class Axiom: ¬ CivilianLaborForceParticipationRate Class Axiom: ¬ EmploymentPopulationRatio Class Axiom: ¬ GrossDomesticProduct Class Axiom: ¬ InflationRate Class Axiom: ¬ UnemploymentRate
EconomicIndicator (economic indicator)	Definition: a statistical measure of some economic activity in the context of a statistical area (region), used for analysis of economic performance and predictions of future performance Example: Example indicators include the average work week, weekly claims for unemployment insurance, new orders, vendor performance, stock prices, and changes in the money supply. Adapted from: Barron's Dictionary of Business and Economic Terms, Fifth Edition, 2012	Parent Class: StatisticalMeasure Property Restriction: = 1 **hasIndicatorValue**.**QuantityValue** (fibo-ind-ei-ei-23) Property Restriction: ∃ **appliesTo**.**StatisticalArea** (fibo-ind-ei-ei-24) Property Restriction: ∀ **hasPeriodicity**.**RecurrenceInterval** (fibo-ind-ei-ei-25) Property Restriction: ∀ **hasReleaseDate**.**Date** (fibo-ind-ei-ei-26) Property Restriction: = 1 **hasReportingPeriod**.**ExplicitDatePeriod** (fibo-ind-ei-ei-27) Property Restriction: ∀ **hasSeriesOrigin**.**Date** (fibo-ind-ei-ei-28) Property Restriction: ∀ **isSeasonallyAdjusted**.**boolean** (fibo-ind-ei-ei-29)
EmployedPopulation (employed population)	Definition: a subset of the civilian labor force considered to be employed during the reporting period Explanatory note: There are a number of distinctions with respect to how individuals are counted from country to country, including whether or not they are considered employed if they are on unpaid leave for some reason, and whether or not they are counted multiple times if they have more than one paying job. Adapted from: U.S. Bureau of Labor Statistics and Statistics Canada reference definitions - https://wiki.edmcouncil.org/pages/viewpage.action?pageId=6358041	Parent Class: CivilianLaborForce
EmploymentPopulatio	Definition: an economic indicator representing the ratio of the	Parent Class:

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nRatio (employment-population ratio)	employed population with respect to the overall civilian non-institutional population of a given economy for some specified period Actual expression: employed population ÷ civilian non-institutional population See also: http://www.bls.gov/news.release/pdf/empsit.pdf	EconomicIndicator, Expression Property Restriction: ∃ **appliesTo**.**EmployedPopulation** (fibo-ind-ei-ei-33) Property Restriction: = 1 **hasArgument**.**EmployedPopulation** (fibo-ind-ei-ei-34) Property Restriction: = 1 **hasArgument**.**CivilianNonInstitutionalPopulation** (fibo-ind-ei-ei-35)
Enterprise (enterprise)	Definition: a functional business entity that produces and/or sells goods or services Explanatory note: An enterprise (a private firm, government, or nonprofit organization) can consist of a single establishment or multiple establishments. All establishments in an enterprise may be classified in one industry (*e.g.*, a chain), or they may be classified in different industries (*e.g.*, a conglomerate). Adapted from: http://www.businessdictionary.com/definition/establishment.html Adapted from: http://www.bls.gov/opub/hom/glossary.htm#E	Parent Class: FunctionalEntity, (Producer ∪ ServiceProvider) Property Restriction: ∃ **appliesTo (Good ∪ Service)** (fibo-ind-ei-ei-59, fibo-ind-ei-ei-60) Property Restriction: ∃ **isClassifiedBy**.**IndustrySectorClassifier** (fibo-ind-ei-ei-61)
EnterprisePopulation (enterprise population)	Definition: a statistical universe consisting of enterprises designed for the purposes of supporting surveys such as those used as the basis for employment and producer price indices	Parent Class: StatisticalUniverse Property Restriction: ∃ **hasMember**.**Enterprise** (fibo-ind-ei-ei-15)
Establishment (establishment)	Definition: an enterprise (or part of an enterprise) that operates from a single physical location Explanatory note: The physical location of a certain economic activity - for example, a factory, mine, store, or office. A single establishment generally produces a single good or provides a single service. Adapted from: http://www.businessdictionary.com/definition/establishment.html Adapted from: http://www.bls.gov/opub/hom/glossary.htm#E	Parent Class: Enterprise Property Restriction: = 1 **hasAddress**.**PhysicalAddress** (fibo-ind-ei-ei-62)
EstablishmentPopulation (establishment population)	Definition: a subset of the enterprise population focused on establishments	Parent Class: EnterprisePopulation Property Restriction: ∃ **hasMember**.**Establishment** (fibo-ind-ei-ei-16)
FixedBasket (fixed basket)	Definition: a basket of goods and services whose quantity and quality are held fixed for some period of time Adapted from: https://www.imf.org/external/pubs/ft/ppi/2010/manual/ppi.pdf	Parent Class: Basket Property Restriction: ∃ **hasConstituent**.**FixedBasketConstituent** (fibo-ind-ei-ei-50) Property Restriction: ∃ **hasDatePeriod**.**DatePeriod** (fibo-ind-ei-ei-51)
FixedBasketConstituent (fixed basket	Definition: a component of a fixed basket	Parent Class: BasketConstituent

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constituent)		Class Axiom: ≡ (∃ isPlayedBy (∃ isConstituentOf.FixedBasket)) (fibo-ind-ei-ei-52, fibo-ind-ei-ei-53) Property Restriction: ∃ **hasIdentity** (**Good** ∪ **Service)** (fibo-ind-ei-ei-54, fibo-ind-ei-ei-55)
GoodsOrServicesPopulation (goods or services population)	Definition: a statistical universe consisting of specific goods and/or services designed for the purposes of supporting surveys such as those used as the basis for price indices Adapted from: https://www.imf.org/external/pubs/ft/ppi/2010/manual/ppi.pdf	Parent Class: StatisticalUniverse Property Restriction: ∃ **hasConstituent** (Good ∪ Service) (fibo-ind-ei-ei-17, fibo-ind-ei-ei-18)
GrossDomesticProduct (gross domestic product, GDP)	Definition: an economic indicator representing the broadest measure of aggregate economic activity, measuring the total unduplicated market value of all final goods and services produced within a statistical area in a period Explanatory note: GDP represents a valuation expressed in terms of the prices actually paid by the purchaser after all applicable taxes and subsidies. Adapted from: http://www.treasury.gov/initiatives/ofr/about/Documents/AR2013_Back_Matter_Glossary+Bib_Refs+Endnotes.pdf Adapted from: https://en.wikipedia.org/wiki/Gross_domestic_product See also: http://unstats.un.org/unsd/nationalaccount/docs/SNA2008.pdf	Parent Class: EconomicIndicator Class Axiom: ¬ UnemploymentRate
Household (household)	Definition: an individual or small group of persons who occupy a housing unit (such as a house or apartment) as their usual place of residence, who pool some, or all, of their income and wealth and who consume certain types of goods and services collectively, mainly housing and food Explanatory note: A household may be either (a) a one-person household, that is to say, a person who makes provision for his or her own food or other essentials for living without combining with any other person to form part of a multi-person household or (b) a multi-person household, that is to say, a group of two or more persons living together who make common provision for food or other essentials for living. The persons in the group may pool their incomes and may, to a greater or lesser extent, have a common budget; they may be related or unrelated persons or constitute a combination of persons both related and unrelated. A household may be located in a housing unit or in a set of collective living quarters such as a boarding house, a hotel or a camp, or may comprise the administrative personnel in an institution. The household may also be homeless. Explanatory note: From the perspective of the U.S Census Bureau, a household includes the related family members and all the unrelated people, if any, such as lodgers, foster children, wards, or employees who share the housing unit. A person living alone in a housing unit, or a group of unrelated people sharing a housing unit such as partners or roomers, is also counted as a household. The count of households excludes group quarters [such as institutional facilities]. There are two	Parent Class: FunctionalEntity Property Restriction: ∃ **hasMember**.**Person** (fibo-ind-ei-ei-56) Property Restriction: = 1 **isLocatedAt**.**HousingUnit** (fibo-ind-ei-ei-57)

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	major categories of households, 'family' and 'nonfamily'. Adapted from: http://stats.oecd.org/glossary/detail.asp?ID=1255 Adapted from: http://www.census.gov/glossary/#term_Household	
HousingUnit (housing unit)	Definition: a house, an apartment, a mobile home or trailer, a group of rooms, or a single room occupied as separate living quarters, or if vacant, intended for occupancy as separate living quarters Explanatory note: Separate living quarters are those in which the occupants live separately from any other individuals in the building and which have direct access from outside the building or through a common hall. For vacant units, the criteria of separateness and direct access are applied to the intended occupants whenever possible. Adapted from: http://www.census.gov/glossary/#term_Housingunit	Parent Class: PhysicalLocation Property Restriction: ∀ **hasAddress**.**PhysicalAddress** (fibo-ind-ei-ei-58)
InflationRate (inflation rate)	Definition: an economic indicator representing a change in prices of goods and services for a specified period, for a given statistical area Explanatory note: Inflation rate can be used to define changes, from period-to-period, in wage (wage inflation), house prices or producer inputs/outputs. It can be calculated month-over-month and quarter-over-quarter, as well as year-over-year, or on any periodic basis required by the publisher and its community of interest. Editorial note: Always either includes or excludes: Energy prices; Food prices. ALL inflation rates cite whether or not they exclude energy and food prices. If nothing stated it is assumed they include them.	Parent Class: EconomicIndicator Property Restriction: = 1 appliesTo.StatisticalArea (fibo-ind-ei-ei-49)
InputProducerPriceIndex (input producer price index, input PPI)	Definition: an economic indicator representing a measure of the rate of change over time in the prices of inputs of goods and services purchased by the producer Adapted from: https://www.imf.org/external/pubs/ft/ppi/2010/manual/ppi.pdf	Parent Class: ProducerPriceIndex
InstitutionalPerson (institutional person)	Definition: a person that resides in an institution for some reason, due, for example, to hospitalization, rehabilitation, or incarceration Adapted from: U.S. Bureau of Labor Statistics and Statistics Canada reference definitions - https://wiki.edmcouncil.org/pages/viewpage.action?pageId=6358041	Parent Class: Person
MetropolitanStatisticalArea (metropolitan statistical area, MSA)	Definition: one or more adjacent counties or county equivalents that have at least one urban core area of at least 50,000 population, plus adjacent territory that has a high degree of social and economic integration with the core as measured by commuting ties Adapted from: https://en.wikipedia.org/wiki/List_of_Metropolitan_Statistical_Areas Adapted from: https://www.census.gov/population/metro/ Adapted from: https://www.whitehouse.gov/sites/default/files/omb/assets/fedreg_2010/06282010_metro_standards-Complete.pdf	Parent Class: StatisticalArea
MicropolitanStatisticalArea (micropolitan statistical area, μSA)	Definition: one or more adjacent counties or county equivalents that have at least one urban core area of at least 10,000 population but less than 50,000, plus adjacent territory that has a high degree of social and economic integration with the core as measured by commuting ties Adapted from: https://en.wikipedia.org/wiki/List_of_micropolitan_statistical_areas	Parent Class: StatisticalArea

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	Adapted from: https://www.census.gov/population/metro/ Adapted from: https://www.whitehouse.gov/sites/default/files/omb/assets/fedreg_2010/06282010_metro_standards-Complete.pdf	
MilitaryPerson (military person)	Definition: a person that is a member of the active duty military Adapted from: U.S. Bureau of Labor Statistics and Statistics Canada reference definitions - https://wiki.edmcouncil.org/pages/viewpage.action?pageId=6358041	Parent Class: LegallyCapablePerson Class Axiom: ¬ Civilian
OutputProducerPriceIndex (output producer price index, output PPI)	Definition: an economic indicator representing a measure of the rate of change over time in the prices of products sold as they leave the producer Adapted from: https://www.imf.org/external/pubs/ft/ppi/2010/manual/ppi.pdf	Parent Class: ProducerPriceIndex
PopulationNotInLaborForce (population not in the labor force)	Definition: a subset of the civilian, noninstitutional population, that is considered neither employed nor unemployed by the reporting agency during the reporting period Explanatory note: There are a number of distinctions with respect to how individuals are counted from country to country, including whether or not they are considered employed if they are on unpaid leave for some reason, and whether or not they are counted multiple times if they have more than one paying job. Adapted from: U.S. Bureau of Labor Statistics and Statistics Canada reference definitions - https://wiki.edmcouncil.org/pages/viewpage.action?pageId=6358041	Parent Class: CivilianNonInstitutionalPopulation Class Axiom: ¬ CivilianLaborForce
ProducerPriceIndex (producer price index, PPI)	Definition: an economic indicator representing a measure of the rate of change over time in the prices of goods and services bought and sold by producers Explanatory note: The standard methodology for a typical PPI is based on a Laspeyres price index with fixed quantities from an earlier base period. The construction of this index can be thought of in terms of selecting a basket of goods and services representative of base-period revenues, valuing this at base-period prices, and then repricing the same basket at current-period prices. The target PPI in this case is defined to be the ratio of these two revenues. Practicing statisticians use this methodology because it has at least three practical advantages. It is easily explained to the public, it can use often expensive and untimely weighting information from the date of the last (or an even earlier) survey or administrative source (rather than requiring sources of data for the current month), and it need not be revised if users accept the Laspeyres premise. Explanatory note: Statistical agencies implement the Laspeyres index by putting it into price-relative (price change from the base period) and revenue-share (from the base period) format. In this form, the Laspeyres index can be written as the sum of base-period revenue shares of the items in the index times their corresponding price relatives. Statistical agency practice has introduced some approximations to the theoretical Laspeyres target due to a number of practical problems with producing the Laspeyres index exactly. For these and other pragmatic reasons, some agencies use alternatives depending on circumstances. See the IMF publication cited for a full explanation of the most commonly used approaches and trade-offs made for determining PPI.	Parent Class: EconomicIndicator, Expression Property Restriction: ∃ **appliesTo** (**EnterprisePopulation, EstablishmentPopulation, GoodsOrServicesPopulation**) (fibo-ind-ei-ei-42, fibo-ind-ei-ei-43) Property Restriction: = 1 **hasArgument** (**EnterprisePopulation, EstablishmentPopulation, GoodsOrServicesPopulation**) (fibo-ind-ei-ei-44, fibo-ind-ei-ei-45) Property Restriction: ∃ **hasArgument**.Fixed**Basket** (fibo-ind-ei-ei-46) Class Axiom: ¬ ConsumerPriceIndex

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	Adapted from: https://www.imf.org/external/pubs/ft/ppi/2010/manual/ppi.pdf	
StatisticalArea (statistical area)	Definition: a physical location that is defined per a nationally consistent program for designating geographic regions for the purposes of tabulating and presenting statistical data Adapted from: U.S. Bureau of Labor Statistics and Statistics Canada reference definitions - https://wiki.edmcouncil.org/pages/viewpage.action?pageId=6358041 Adapted from: U.S. Bureau of Labor Statistics and Statistics Canada reference definitions - https://wiki.edmcouncil.org/display/IND/Statistics+Canada+Census+Information Adapted from: http://www.census.gov/prod/cen2010/doc/gqsf.pdf	Parent Class: PhysicalLocation Property Restriction: ∃ **isGovernedBy**.GovernmentBody (fibo-ind-ei-ei-19) Property Restriction: ∃ **isIdentifiedBy**.StatisticalAreaIdentifier (fibo-ind-ei-ei-20)
StatisticalPopulation (statistical population)	Definition: a statistical universe filtered by time and region Explanatory note: A common aim of statistical analysis is to produce information about some chosen population. In statistical inference, a subset of the population (a statistical sample) is chosen to represent the population in a statistical analysis. If a sample is chosen properly, characteristics of the entire population that the sample is drawn from can be estimated from corresponding characteristics of the sample. Adapted from: http://stats.oecd.org/glossary/detail.asp?ID=2079	Parent Class: StatisticalUniverse Property Restriction: ∀ **hasPopulationSize**.decimal (fibo-ind-ei-ei-08) Property Restriction: ∀ **hasTimeContext**.**ExplicitDatePeriod** (fibo-ind-ei-ei-09) Property Restriction: ∀ **hasRegionalContext**.**StatisticalArea** (fibo-ind-ei-ei-10)
StatisticalProgram (statistical program)	Definition: a publication program that presents a detailed investigation and analysis of a subject or situation involving one or more studies or surveys Adapted from: http://www.oxforddictionaries.com/definition/english/study	Parent Class: Publication Property Restriction: ∃ **specifies**.**StatisticalUniverse** (fibo-ind-ei-ei-04) Property Restriction: ∀ **hasReferencePeriod**.**BusinessRecurrenceInterval** (fibo-ind-ei-ei-05) Property Restriction: ∀ **hasReportingPeriod**.**ExplicitDatePeriod** (fibo-ind-ei-ei-06) Property Restriction: ∀ **hasReleaseDate**.**Date** (fibo-ind-ei-ei-07)
StatisticalUniverse (statistical universe)	Definition: a collection representing the total membership, or 'universe', of people, resources, products, services, events, or entities of interest for some question, experiment, survey or statistical program Example: A statistical universe can be a group of actually existing objects (*e.g.* the set of all stars within the Milky Way galaxy) or a hypothetical and potentially infinite group of objects conceived as a generalization from experience (e.g. the set of all possible hands in a game of poker). Adapted from: http://stats.oecd.org/glossary/detail.asp?ID=2087	Parent Class: Collection Property Restriction: ∀ **hasUniverseSize**.**decimal** (fibo-ind-ei-ei-02) Property Restriction: ∃ **hasContext**.**StatisticalProgram** (fibo-ind-ei-ei-03)

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UnemployedPopulation (unemployed population)	Definition: a subset of the civilian labor force that is considered to have had no employment but was available for work, except for temporary illness, and had made specific efforts to find employment sometime during a specified period, during the reporting period Explanatory note: Persons who were waiting to be recalled to a job from which they had been laid off need not have been looking for work to be classified as unemployed. Adapted from: U.S. Bureau of Labor Statistics and Statistics Canada reference definitions - https://wiki.edmcouncil.org/pages/viewpage.action?pageId=6358041	Parent Class: CivilianLaborForce Class Axiom: ¬ EmployedPopulation
UnemploymentRate (unemployment rate)	Definition: an economic indicator representing the ratio of the unemployed population with respect to the civilian labor force of a given economy for some specified period Actual expression: unemployed population ÷ civilian labor force Explanatory note: Persons are classified as unemployed if they do not have a job, have actively looked for work in the prior 4 weeks, and are currently available for work. Workers expecting to be recalled from layoff are counted as unemployed, whether or not they have engaged in a specific jobseeking activity. In all other cases, the individual must have been engaged in at least one active job search activity in the 4 weeks preceding the interview and be available for work (except for temporary illness). Adapted from: http://www.bls.gov/cps/faq.htm#Ques3 See also: http://www.bls.gov/news.release/pdf/empsit.pdf	Parent Class: EconomicIndicator, Expression Property Restriction: ∃ appliesTo.UnemployedPopulation (fibo-ind-ei-ei-36) Property Restriction: = 1 hasArgument.UnemployedPopulation (fibo-ind-ei-ei-37) Property Restriction: = 1 hasArgument.CivilianLaborForce (fibo-ind-ei-ei-38)
ValueAddedProducerPriceIndex (value-added producer price index, value-added PPI)	Definition: an economic indicator representing a weighted average of the input and output producer price indices Adapted from: https://www.imf.org/external/pubs/ft/ppi/2010/manual/ppi.pdf	Parent Class: ProducerPriceIndex Property Restriction: ∃ hasArgument.InputProducerPriceIndex (fibo-ind-ei-ei-48) Property Restriction: ∃ hasArgument.OutputProducerPriceIndex (fibo-ind-ei-ei-47)

Properties

Name	Annotations	Property Axioms
actualExpression (actual expression)	Definition: the calculation or expression used to determine the value of the indicator	
hasIndicatorValue (has indicator value)	Definition: specifies quantity value for a given indicator	Parent Property: has Range: QuantityValue
hasPeriodicity (has periodicity)	Definition: specifies a recurrence interval (monthly, quarterly, annual) that an indicator reflects	Parent Property: hasRecurrenceInterval Range: RecurrenceInterval
hasReferencePeriod (has reference period)	Definition: specifies a reference (baseline) recurrence interval for which a given economic indicator applies	Parent Property: hasRecurrenceInterval Range: RecurrenceInterval
hasRegionalContext (has regional context)	Definition: specifies the regional (geopolitical) context for a given measurement, population, or economic indicator	Parent Property: hasContext Range: StatisticalArea

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hasReleaseDate (has release date**)**	Definition: specifies the release date for a given economic indicator	Parent Property: hasDate Range: Date
hasReportingPeriod (has reporting period)	Definition: specifies the reporting period for which a given economic indicator applies	Parent Property: hasDatePeriod Range:ExplicitDatePeriod
hasSeriesOrigin (has series origin**)**	Definition: specifies the original starting date for the time series for a given economic indicator	Parent Property: hasStartDate Range: Date
hasTimeContext (has time context**)**	Definition: specifies the time context for a given measurement, population, or economic indicator	Parent Property: hasContext, hasDatePeriod Range: ExplicitDatePeriod
excludesEnergyAndFood (excludes energy and food)	Definition: a predicate indicating whether the index excludes energy and food prices	Domain: ConsumerPriceIndex Range: yesOrNo
hasMinimumLegalWorkingAge (has minimum legal working age)	Definition: a predicate indicating the legal working age (minimum), in years, of people that are counted as members of the working population Explanatory note: The working-age population is the total population in a region, within a set range of ages, that is considered to be able and likely to work. The working-age population measure is used to give an estimate of the total number of potential workers within an economy. For example, in the U.S., it is 16, whereas in Canada it is 15. Adapted from: http://www.investopedia.com/terms/w/working-age-population.asp	Range: integer
hasPopulationSize (has population size)	Definition: a predicate indicating the number of elements in a given population	Parent Property: hasAmount Range: decimal
hasUniverseSize (has universe size)	Definition: a predicate indicating the number of elements in a given universe	Parent Property: hasAmount Range: decimal
isSeasonallyAdjusted (is seasonally adjusted)	Definition: a predicate indicating whether some published formal method is applied that compensates for seasonal variations in the population or index value Explanatory note: Example explanation from the US Bureau of Labor Statistics: Because price data are used for different purposes by different groups, the Bureau of Labor Statistics publishes seasonally adjusted as well as unadjusted changes each month. ... Seasonal factors used in computing the seasonally adjusted indexes are derived by the X-13ARIMA-SEATS Seasonal Adjustment Method. Seasonally adjusted indexes and seasonal factors are computed annually. Each year, the last five years of seasonally adjusted data are revised.	Range: boolean

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9.5.2 Ontology: Economic Indicator Publishers

This ontology provides concepts descriptive of the publishers of market indicators, such as gross domestic product, employment statistics, inflation rates and so on. These may include government or quasi-government bodies, international agencies, third parties and data providers.

Issue	FIBOIND-24	Need a better representation for general economic indicators

Table 9.15 Economic Indicator Publishers Ontology Metadata

Metadata Term	Value
sm:filename	EconomicIndicatorPublishers
sm:fileAbbreviation	fibo-ind-ei-pub
OntologyIRI	http://www.omg.org/spec/EDMC-FIBO/IND/EconomicIndicators/EconomicIndicatorPublishers/
owl:versionIRI	http://www.omg.org/spec/EDMC-FIBO/IND/2016~~5~~08~~5~~01/EconomicIndicators/EconomicIndicatorPublishers/
sm:dependsOn	http://www.omg.org/spec/EDMC-FIBO/FND/ http://www.omg.org/spec/EDMC-FIBO/BE/ http://www.omg.org/spec/EDMC-FIBO/IND/Indicators/Indicators/ http://www.omg.org/spec/EDMC-FIBO/IND/EconomicIndicators/EconomicIndicators/

Issue	FIBOIND-24	Need a better representation for general economic indicators

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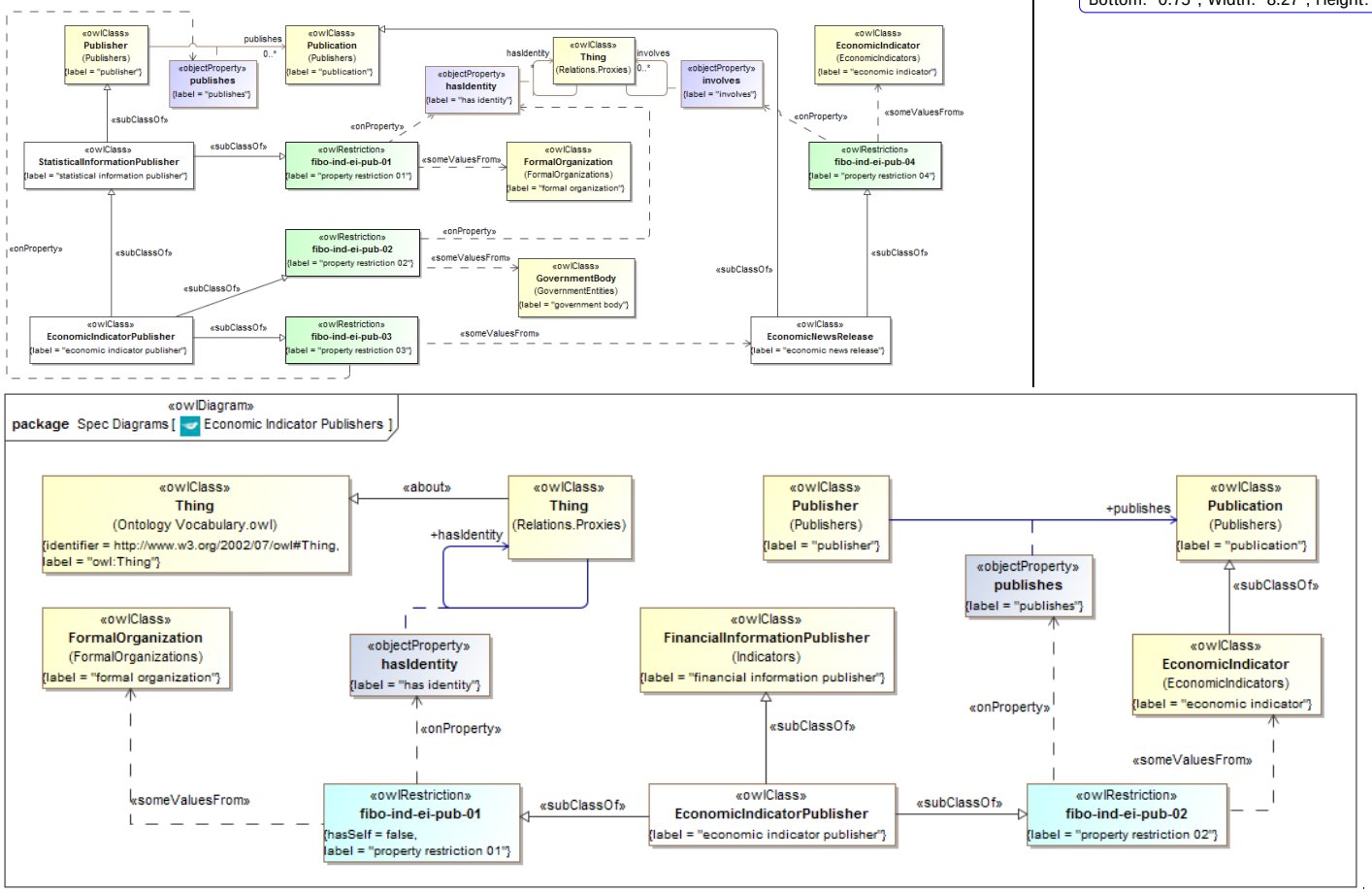

Figure 9.~~1628~~ Statistical Information and Economic Indicator Publishers~~Economic Indicator Publishers Concepts~~

Economic indicators are statistical in nature, typically published by government organizations, as shown in Figure 9.28.~~Diagram showing all of the concepts in the Economic Indicators Publishers ontology.~~

Issue	FIBOIND-24	Need a better representation for general economic indicators

Table 9.16 Economic Indicator Publishers Ontology Details

~~**Classes**~~

~~**Name**~~	~~**Label**~~	~~**definition**~~	~~**parent**~~

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Name	Label	definition	parent
EconomicIndicatorPublisher	economic indicator publisher	a financial information publisher that publishes economic indicators	financial information publisher property restriction 01 property restriction 02

Restrictions

Name	Label	Expressions
fibo-ind-ei-pub-01	property restriction 01	hasIdentity some FormalOrganization
fibo-ind-ei-pub-02	property restriction 02	publishes some EconomicIndicator

Classes

Name	Annotations	Class Expressions
EconomicIndicatorPublisher (economic indicator publisher)	Definition: a statistical information publisher that publishes economic news, including economic indicators	Parent Class: StatisticalInformationPublisher Property Restriction: ∃ **hasIdentity**.**GovernmentBody** (fibo-ind-ei-pub-02) Property Restriction: ∃ **publishes**.**EconomicNewsRelease** (fibo-ind-ei-pub-03)
EconomicNewsRelease (economic news release)	Definition: published statistical information that is about economic indicators and possibly other economic news	Parent Class: Publication Property Restriction: ∃ **involves**.**EconomicIndicator** (fibo-ind-ei-pub-04)
StatisticalInformationPublisher (statistical information publisher)	Definition: a publisher that publishes statistical information	Parent Class: Publisher Property Restriction: ∃ **hasIdentity**.**FormalOrganization** (fibo-ind-ei-pub-01)

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10 Jurisdiction-Specific Ontologies

10.1 Overview

This section defines the terms, definitions, relationships, and additional logic that extend the FIBO Indices and Indicators (IND) specification with respect to jurisdiction-specific individuals. Note that these are provided as starting points, and are not intended to be comprehensive. Having said this, the definitions provided in this section reflect some of the more important jurisdiction-specific entities identified by contributing subject matter experts (SMEs).

10.2 Jurisdiction-Specific Economic Indicators

The ontologies identified herein incorporate concepts and individuals representing jurisdiction-specific economic indicators for use in other FIBO IND ontologies as well as across FIBO specifications that depend on the IND specification. They are introduced in the context of continent-specific sub-modules, *(e.g.*, Europe, North America, Asia), following the approach taken in FIBO BE and FIBO FBC, for the management of jurisdiction-specific content in the FIBO family of ontologies in general. Country-level content is provided for North America only, and specifically for the United States and Canada, at this time. Extensions to support other North American countries, European countries, and other continents may be added as time and requirements dictate in future revisions of the IND specification.

The ontologies themselves are documented with respect to metadata only. The corresponding machine-readable files are considered to be a normative part of this specification, however.

10.2.1 North American Economic Indicators

10.2.1.1 Canadian Economic Indicators Ontology

This ontology provides a preliminary set of basic Canadian economic indicators, extending the more general indicators provided in the Economic Indicators ontology.

Metadata defining the primary metadata elements for the Canadian Economic Indicators ontology are given in Table 10.1.

Table 10.1 Canadian Economic Indicators Ontology Metadata

Metadata Term	Value
sm:filename	CAEconomicIndicators.rdf
sm:fileAbbreviation	fibo-ind-ei-caei
OntologyIRI	http://www.omg.org/spec/EDMC-FIBO/IND/EconomicIndicators/NorthAmericanIndicators/CAEconomicIndicators/
owl:versionIRI	http://www.omg.org/spec/EDMC-FIBO/IND/20160801/EconomicIndicators/NorthAmericanIndicators/CAEconomicIndicators/
sm:dependsOn	http://www.omg.org/spec/EDMC-FIBO/FND/ http://www.omg.org/spec/EDMC-FIBO/BE/ http://www.omg.org/spec/EDMC-FIBO/IND/EconomicIndicators/ http://www.omg.org/spec/EDMC-FIBO/IND/EconomicIndicators/EconomicIndicatorPublishers/

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10.2.1.2 American Economic Indicators Ontology

This ontology provides a preliminary set of basic American economic indicators, extending the more general indicators provided in the Economic Indicators ontology.

Metadata defining the primary metadata elements for the American Economic Indicators ontology are given in Table 10.2.

Table 10.2 American Economic Indicators Ontology Metadata

Metadata Term	Value
sm:filename	USEconomicIndicators.rdf
sm:fileAbbreviation	fibo-ind-ei-usei
OntologyIRI	http://www.omg.org/spec/EDMC-FIBO/IND/EconomicIndicators/NorthAmericanIndicators/USEconomicIndicators/
owl:versionIRI	http://www.omg.org/spec/EDMC-FIBO/IND/20160801/EconomicIndicators/NorthAmericanIndicators/USEconomicIndicators/
sm:dependsOn	http://www.omg.org/spec/EDMC-FIBO/FND/ http://www.omg.org/spec/EDMC-FIBO/BE/ http://www.omg.org/spec/EDMC-FIBO/FBC/ http://www.omg.org/spec/EDMC-FIBO/IND/EconomicIndicators/EconomicIndicators/ http://www.omg.org/spec/EDMC-FIBO/IND/EconomicIndicators/EconomicIndicatorPublishers/

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Annex A: Machine-readable files Accompanying this Specification

(normative)

The FIBO ontologies are delivered as (1) RDF/XML serialized OWL (normative and definitive), (2) UML XMI, serialized from UML with the ODM profiles for RDF and OWL applied (normative), (3) ODM XMI, serialized based on the ODM MOF metamodels for RDF and OWL (normative), and (4) ancillary Visual Ontology Modeler (VOM) model files, based on the VOM plug-in to MagicDraw (informative). If there are differences between the OWL files, ODM XMI, and UML XMI, the OWL files take precedence, followed by the UML XMI, and finally the ODM XMI.

Regardless of their form, each of the ontologies included in Indices and Indicators makes normative reference to the DCMI Dublin Core Metadata Terms [Dublin Core], W3C Simple Knowledge Organization System (SKOS) Recommendation [SKOS] and the OMG Architecture Board's Specification Metadata Recommendation [OMG AB Specification Metadata], which are not part of this specification.

The individual RDF/XML files are organized by module (directory), and within a given module, alphabetically by name, as shown in the URI structure for each individual OWL file. These files are UTF-8 conformant XML Schema files that are also OWL 2 compliant, and may be examined using any text editor, XML editor, or RDF or OWL editor. They have been verified for syntactic correctness via the W3C RDF Validator and University of Manchester OWL 2 Validator. They have also been checked for logical consistency using the Pellet OWL 2 reasoner from Clark & Parsia as well as the HermiT OWL 2 reasoner from Oxford University. It is anticipated that the OWL ontologies will be dereference-able, together with technical documentation (HTML) from the OMG site once the specification is adopted.