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Financial Industry Business Ontology – Indices and Indicators

Version 1.0

http://www.omg.org/spec/EDMC-FIBO/IND/20160801/ForeignExchange/ForeignExchange.xml

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http://www.omg.org/spec/EDMC-FIBO/IND/20160801/Indicators/Indicators.xmi

http://www.omg.org/spec/EDMC-FIBO/IND/20160801/InterestRates/InterestRates.xmi

http://www.omg.org/spec/EDMC-FIBO/IND/20160801/InterestRates/InterestRatePublishers.xmi

Informative:

http://www.omg.org/spec/EDMC-FIBO/IND/20160801/AboutIND.rdf

http://www.omg.org/spec/EDMC-FIBO/IND/20160801/AboutIND-1.0.rdf

http://www.omg.org/spec/EDMC-FIBO/IND/20160801/AboutIND-1.0-NorthAmerica.rdf

http://www.omg.org/spec/EDMC-FIBO/IND/20160801/catalog-v001.xml

http://www.omg.org/spec/EDMC-FIBO/IND/20150501/EconomicIndicators/AboutEconomicIndicators.rdf

http://www.omg.org/spec/EDMC-FIBO/IND/20150501/ForeignExchange/AboutForeignExchange.rdf

http://www.omg.org/spec/EDMC-FIBO/IND/20150501/Indicators/AboutIndicators.rdf

http://www.omg.org/spec/EDMC-FIBO/IND/20150501/InterestRates/AboutInterestRates.rdf

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Note: The latest version of each of the machine-readable files listed above (normative and informative) can also be found at the corresponding non-versioned URL, i.e., at the URL listed without the "/201xxxxx/" component.

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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.

OMG member companies write, adopt, and maintain its specifications following a mature, open process. OMG's specifications implement the Model Driven Architecture® (MDA®), maximizing ROI through a full-lifecycle approach to enterprise integration that covers multiple operating systems, programming languages, middleware and networking infrastructures, and software development environments. OMG's specifications include: UML® (Unified Modeling Language®); CORBA® (Common Object Request Broker Architecture); CWM™ (Common Warehouse Metamodel™); and industry-specific standards for dozens of vertical markets.

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OMG Specifications

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Modeling and Metadata Specifications

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- UML Profiles

Modernization Specifications

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

- CORBAServices
- CORBAFacilities

OMG Domain Specifications

CORBA Embedded Intelligence Specifications

CORBA Security Specifications

Signal and Image Processing Specifications

All of OMG's formal specifications may be downloaded without charge from our website. (Products implementing OMG specifications are available from individual suppliers.) Copies of specifications, available in PostScript and PDF format, may be obtained from the Specifications Catalog cited above or by contacting the Object Management Group, Inc. at:

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Typographical Conventions

The type styles shown below are used in this document to distinguish programming statements from ordinary English. However, these conventions are not used in tables or section headings where no distinction is necessary.

Times/Times New Roman/Liberation Serif – 10 pt.: Standard body text

Helvetica/Arial – 10 pt. Bold: OMG Interface Definition Language (OMG IDL) and syntax elements.

Courier – 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 via the report form at:

http://issues.omg.org/issues/create-new-issue

1   Scope

1.1   Background

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.

1.2   Overview

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.

1.3   Scope of Financial Industry Business Ontologies: Indices and Indicators

1.3.1   How This Specification fits with the Overall FIBO

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 the FIBO Business Entities [FIBO BE] and FIBO Financial Business and Commerce [FIBO FBC] specifications.

1.3.2   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.

1.3.3   Relation to Existing Market Index and Economic Indicator Standards

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.

1.4   Definitions

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.

1.4.1   Definitions Policy

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. 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):

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.

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.

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.

2   Conformance

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

    o In diagrams

    o In spreadsheets or 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

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.

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.

[†] "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].

3   References

3.1   Normative References

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/.
[FIBO BE]	Financial Industry Business Ontology (FIBO) – Business Entities (EDMC-FIBO/BE). Available at http://www.omg.org/spec/EDMC-FIBO/BE/, dtc/15-02-20
[Foundations]	Financial Industry Business Ontology (FIBO) – Foundations (EDMC-FIBO/FND). Available at http://www.omg.org/spec/EDMC-FIBO/FND/, dtc/14-12-04
[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, v2.5. Available at http://www.omg.org/spec/MOF/2.5/.
[MOF XMI]	MOF 2/XMI (XML Metadata Interchange) Mapping Specification, v2.5. Available at http://www.omg.org/spec/XMI/2.5/.
[ODM]	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

Reference	Description
[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 Concepts]	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 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/.
[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/.
[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, 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
[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/.
[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, v2.5. Available at http://www.omg.org/spec/MOF/2.5/.
[MOF XMI]	MOF 2/XMI (XML Metadata Interchange) Mapping Specification, v2.5. Available at http://www.omg.org/spec/XMI/2.5/.
[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
[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 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/.
[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/..
[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, 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/.

3.3   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

4 Terms and Definitions

Content

Subject matter

Business conceptual model

A model which represents and only represents business <u>subject matter</u> without reference to the design of any solution or data model representation.

Ontology

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 <u>subject matter</u>.

Operational Ontology

An <u>ontology</u> which is intended for use within some application.

Subject matter

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

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

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.

6　Additional Information

6.1　Audience

This specification has the following audiences:

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

6.1.1　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.

6.1.2　Finance Industry Business Community

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.

6.1.3　Information Technology (IT) Architects, Enterprise Architects, and Developers

These include but are not limited to:

- Tool vendors and developers
- Application and content providers / enriched content providers
- Business Analysts – including business analysts in the banking community, business architects, process engineers, metadata and data governance experts, and so forth
- IT and technical management

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

6.1.4　Taxonomists and Ontologists

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.

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
- Bureau of Economic Analysis (BEA)
- Bureau of Labor Statistics (BLS)
- Citigroup Inc.
- Credit Suisse Group AG
- Deutsche Bank
- Federal Reserve Board (FRB)
- Global LEI Foundation / Tahoe Blue Ltd
- Hewlett Packard Enterprise / Mphasis
- No Magic
- Nordea Bank AB
- State Street
- Statistics Canada
- Thematix Partners LLC
- Working Ontologist
- University College Cork

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. 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.	$C \cup D$
enumeration	An enumeration defines a class by enumerating all its instances.	$oneOf(i_1, i_2, i_3, \ldots i_n)$
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).	$\forall R.C$, 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).	$\exists R.C$, 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).	$\forall R.I$, 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).	$\leq n\ R$ (for unqualified restrictions) $\leq n\ R.C$ (for qualified restrictions)
minimum cardinality	Minimum cardinality restrictions restrict the cardinality of possible fillers to at least the number specified (inclusive).	$\geq n\ R$ (for unqualified restrictions) $\geq n\ R.C$ (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.

7 Introduction

7.1 Specification Overview

7.1.1 Non-Technical Overview

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.

7.1.2 Technical Overview

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.

7.2 Business Usage Scenarios

7.2.1 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

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.

8.2 Dependencies on Other FIBO Specifications

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.

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.

8.4 Namespace Definitions

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 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.

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/`
`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/`

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 "-":

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

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.

Table 8.2 - 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`	`http://www.omg.org/spec/EDMC-FIBO/IND/ForeignExchange/AboutForeignExchange/`
`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/`

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

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9 Model Content Reports

9.1 Overview

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

9.2 Module: Indicators

Table 9.1 - IndicatorsModule 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.

9.2.1 Ontology: Indicators

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/20160801/Indicators/Indicators/
sm:dependsOn	http://www.omg.org/spec/EDMC-FIBO/FND/ http://www.omg.org/spec/EDMC-FIBO/BE/
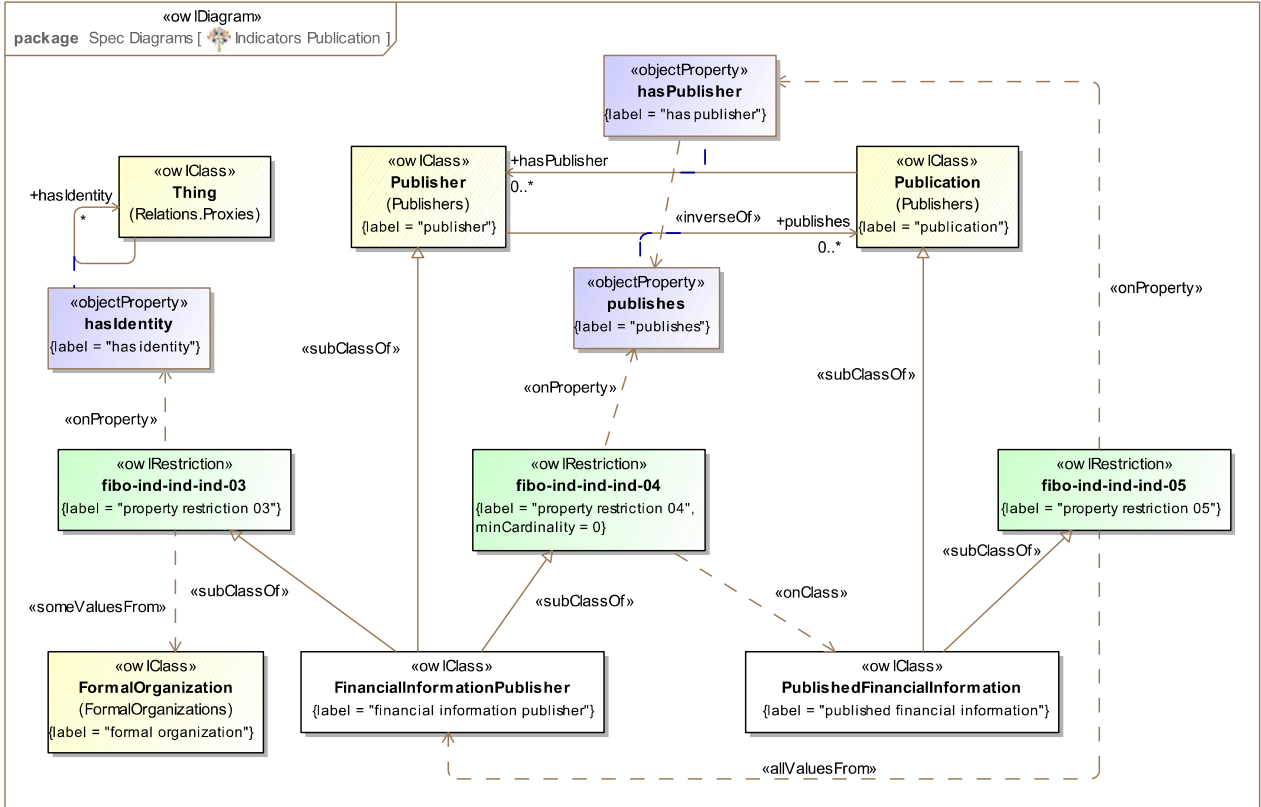
Figure 9.1 - Indicators Publication Concepts

Diagram showing the basic concepts in the Indicators Publishers ontology for publication of market indices and indicators.
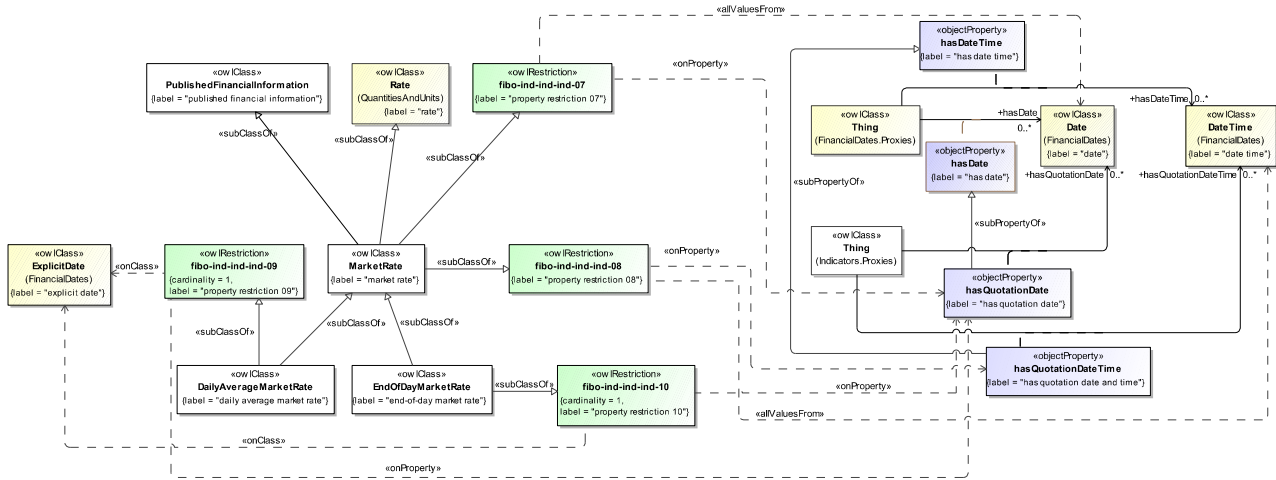
Figure 9.2 - Definition of Market Rate

Figure 9.2 defines market rates as published information, including but not limited to average daily and end-of-day rates.
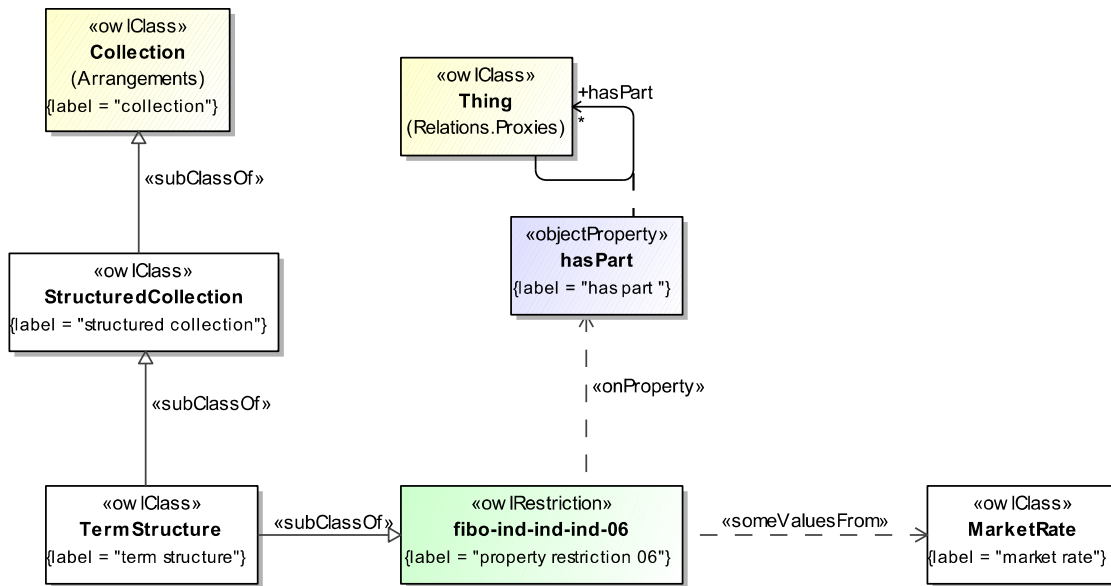
Figure 9.3 - Definition of Term Structure

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.
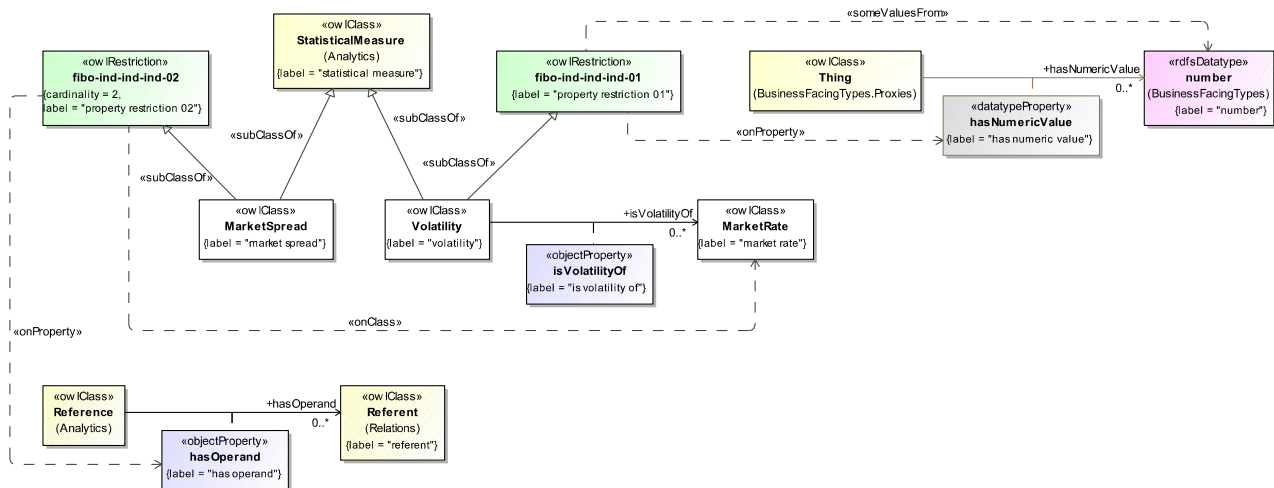
Figure 9.4 - Definition of Statistical Measures

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.

Table 9.3 - Indicators Ontology Details

Classes

Name	Annotations	Class Expressions
DailyAverageMarketRate (daily average market rate)	<u>Definition</u>: 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 <u>Adapted from</u>: http://www.investopedia.com/terms/m/marketaverage.asp	<u>Parent Class</u>: MarketRate <u>Property Restriction</u>: = 1 **hasQuotationDate**.**ExplicitDate** (fibo-ind-ind-ind-09)
EndOfDayMarketRate (end-of-day market rate)	<u>Definition</u>: a measure of the price level (value) of a given market rate of the end of the business day for a specific date	<u>Parent Class</u>: MarketRate <u>Property Restriction</u>: = 1 **hasQuotationDate**.**ExplicitDate** (fibo-ind-ind-ind-10)
FinancialInformation Publisher (financial information publisher)	<u>Definition</u>: 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	<u>Parent Class</u>: Publisher <u>Property Restriction</u>: ∃ **hasIdentity**.**FormalOrganization** (fibo-ind-fctind-ind-03) <u>Property Restriction</u>: ≥ 0 **publishes**.**PublishedFinancial Information** (fibo-ind-ind-ind-04)

Name	Annotations	Class Expressions
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. (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.	Parent Class: Rate, PublishedFinancialInformation Property Restriction: $\forall$ **hasQuotationDate**.**Date** (fibo-ind-ind-ind-07) Property Restriction: $\forall$ **hasQuotationDateTime**.**DateTime** (fibo-ind-ind-ind-08)
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)
PublishedFinancial Information (published financial information)	Definition: published information made available by a financial information publisher	Parent Class: Publication Property Restriction: $\forall$ **hasPublisher**.**FinancialInformation Publisher** (fibo-ind-ind-ind-05)
StructuredCollection (structured collection)	Definition: a collection that has a clearly defined structure or organization	Parent Class: Collection

| Name	Annotations	Class Expressions
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 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	Parent Class: StructuredCollection Property Restriction: ∃ **hasPart**.**MarketRate** (fibo-ind-ind-ind-06)
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

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.

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.

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/20160801/ForeignExchange/ForeignExchange/
sm:dependsOn	http://www.omg.org/spec/EDMC-FIBO/FND/ http://www.omg.org/spec/EDMC-FIBO/IND/Indicators/Indicators/
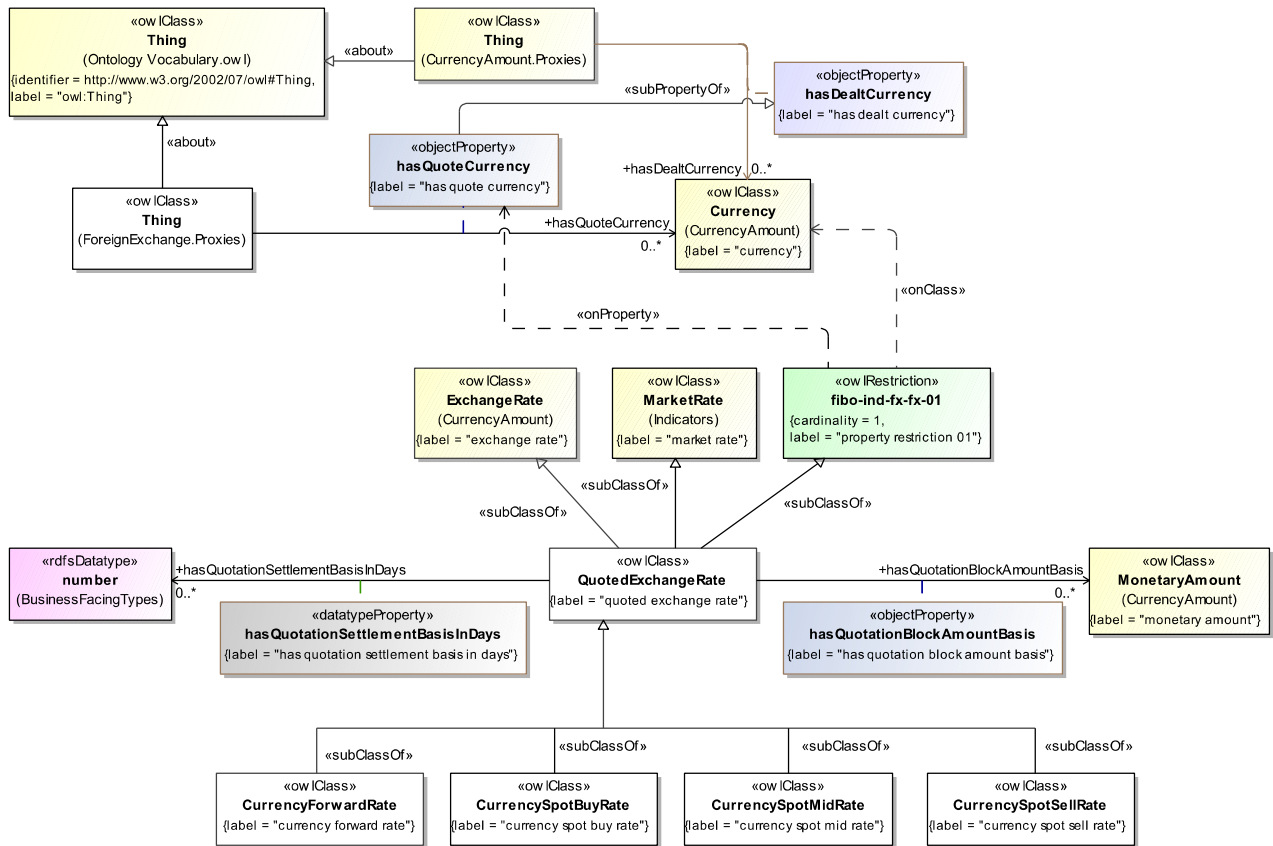
Figure 9.5 - Foreign Exchange: Exchange Rate Concepts

Diagram showing the basic concepts in the Foreign Exchange ontology.
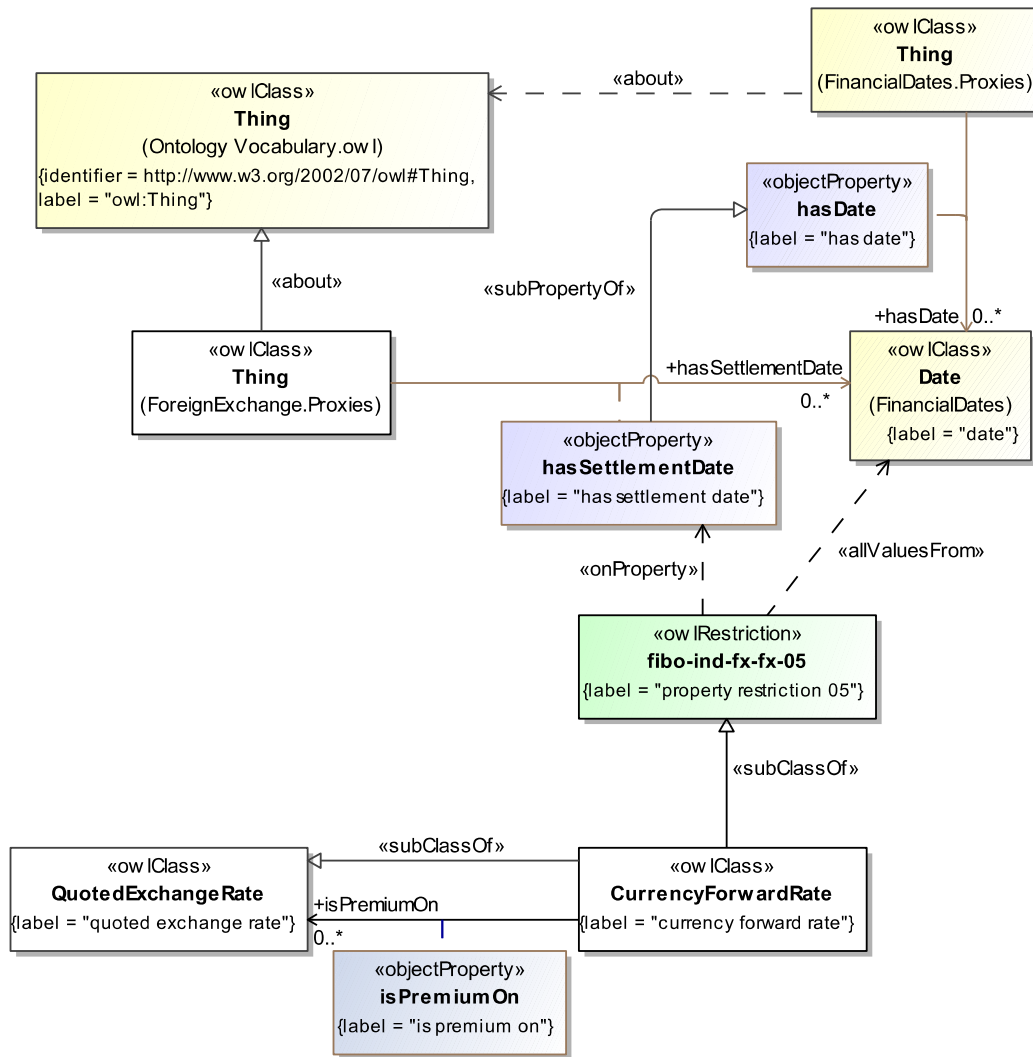
Figure 9.6 - Foreign Exchange: Foreign Rate Concepts

Diagram showing forward rate concepts in the Foreign Exchange ontology.
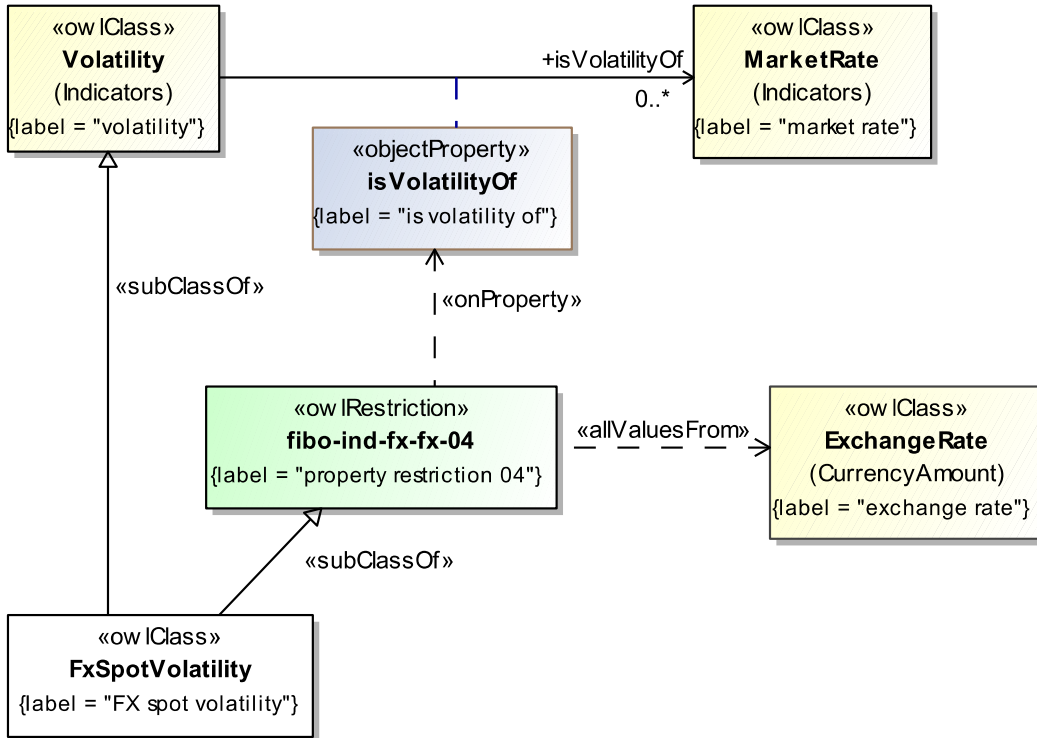
Figure 9.7 - Foreign Exchange: Spot Volatility Concepts

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

Table 9.6 - Foreign Exchange Ontology Details

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
HasQuotationBlockAmount Basis (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
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
hasQuotationSettlementBasis InDays (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

9.4   Module: Interest Rates

Table 9.7 - Interest Rates Ontology Metadata

Metadata Term	Value
sm:moduleName	InterestRates
sm:moduleAbbreviation	FIBO-IND-IR
sm:moduleVersion	1
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.

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.

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/20160801/InterestRates/InterestRates/
sm:dependsOn	http://www.omg.org/spec/EDMC-FIBO/FND/ http://www.omg.org/spec/EDMC-FIBO/IND/Indicators/Indicators/
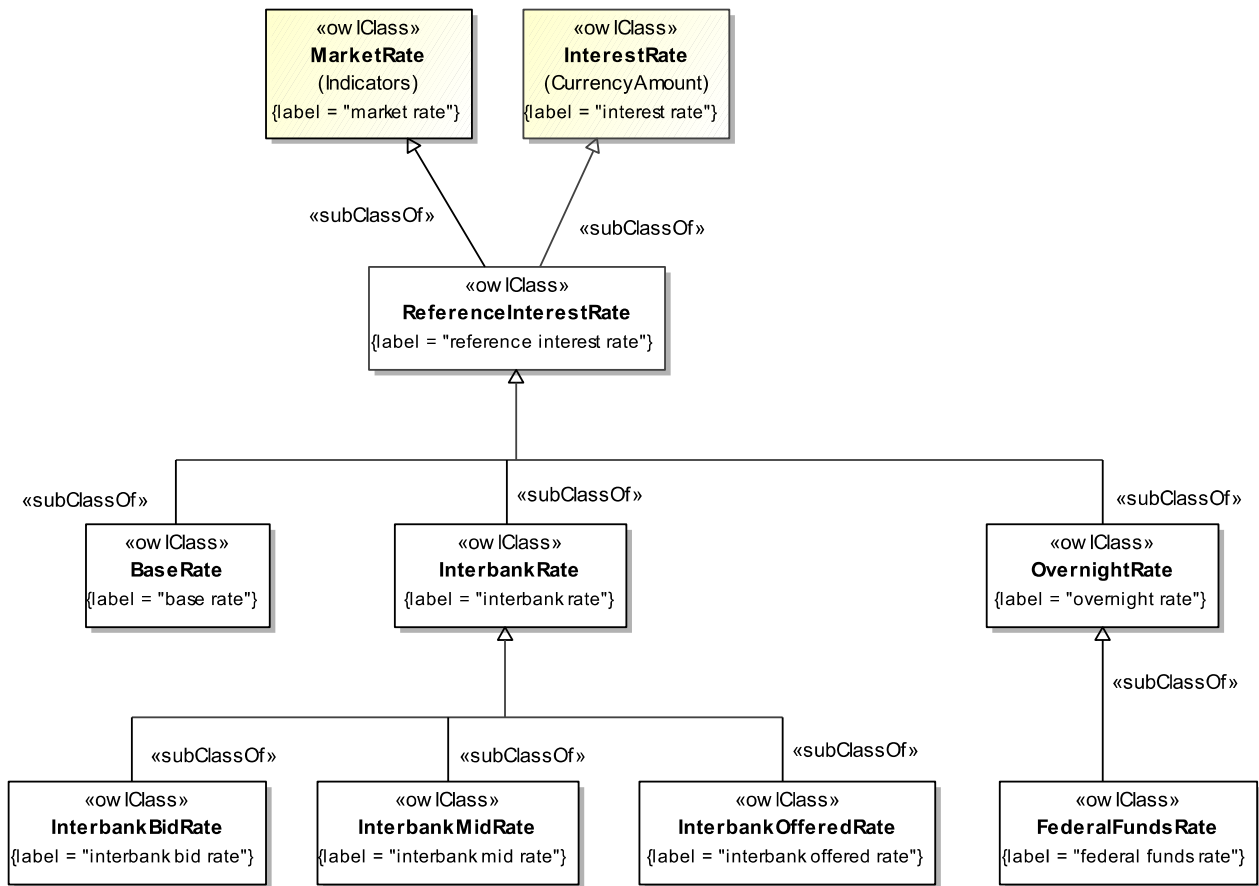
Figure 9.8 - Interest Rates Concepts

Figure 9.8, above, depicts the primary concepts in the Interest Rates ontology.

| «owlClass»
 ReferenceInterestRate
 {label = "reference interest rate"} | «subClassOf» | «owlRestriction»
 fibo-ind-ir-ir-01
 {label = "property restriction 01"} |

«onProperty»

| «objectProperty»
 hasReferenceCurrency
 {label = "has reference currency"} | «subPropertyOf» | «objectProperty»
 hasCurrency
 {label = "has currency"} |

+hasReferenceCurrency 0..*

+hasCurrency
0..*

| «owlClass»
 Currency
 (CurrencyAmount)
 {label = "currency"} | | «owlClass»
 MonetaryAmount
 (CurrencyAmount)
 {label = "monetary amount"} |

«allValuesFrom»

Figure 9.9 - Interest Rate Definition

Figure 9.9 defines reference interest rates, which are interest rates that can be used for reference purposes in financial instruments, market valuations, and so forth.
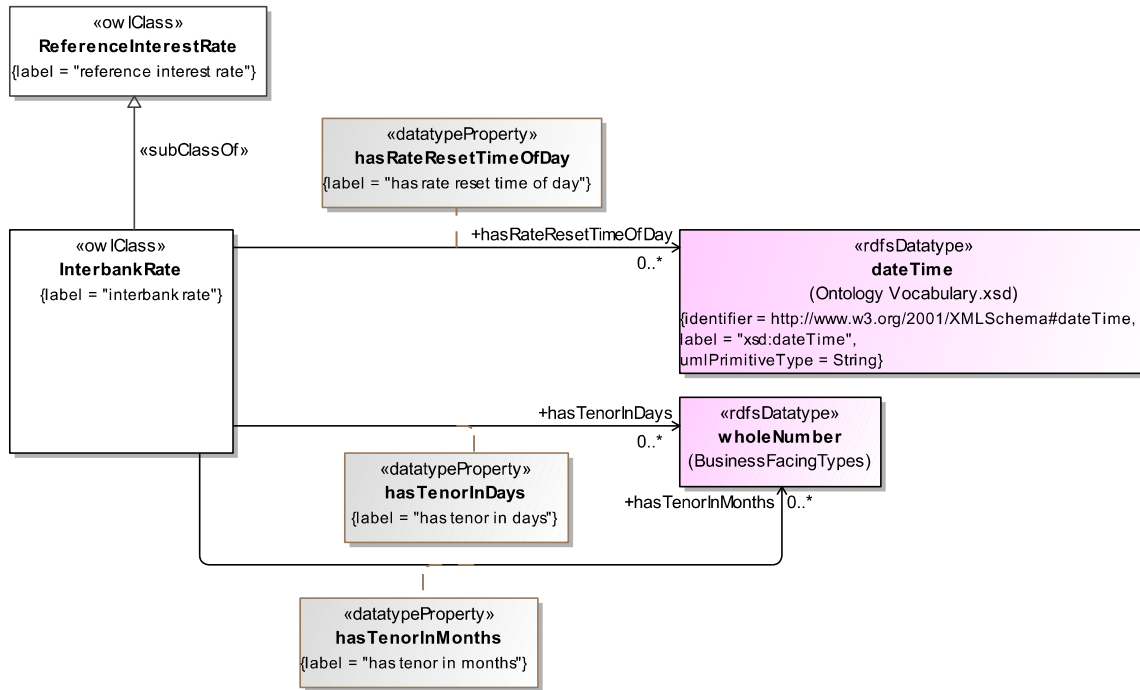
Figure 9.10 - Interbank Rates Definition

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.

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

Name	Annotations	Class Expressions
FederalFundsRate (US federal funds rate, fed funds rate, federal funds rate)	<u>Definition</u>: 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 <u>Explanatory note</u>: 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. <u>Explanatory note</u>: 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. <u>See also</u>: http://www.newyorkfed.org/markets/omo/dmm/fed fundsdata.cfm	<u>Parent Class</u>: OvernightRate
InterbankBidRate (interbank bid rate)	<u>Definition</u>: an interbank rate that is the interest rate at which participating banks are willing to borrow deposits from other banks <u>Explanatory note</u>: 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.	<u>Parent Class</u>: InterbankRate
InterbankMidRate (interbank mid rate)	<u>Definition</u>: an interbank rate that represents the mid-point between bid and offer rates	<u>Parent Class</u>: InterbankRate
InterbankOfferedRate (interbank offered rate)	<u>Definition</u>: an interbank rate that is the interest rate at which participating banks lend money	<u>Parent Class</u>: InterbankRate
InterbankRate (interbank rate)	<u>Definition</u>: a reference rate that is the rate of interest charged on short-term loans between banks <u>Explanatory note</u>: 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.	<u>Parent Class</u>: ReferenceInterestRate

Name	Annotations	Class Expressions
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: $\forall$ **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 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

9.4.2 Ontology: Interest Rates Publishers

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

Table 9.10 - Interest Rates 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/20160801/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/

Figure 9.11 - Interest Rate Publishers Concepts

Diagram showing the main types of Interest Rate Publishers.

Figure 9.12 - Definition of Interest Rate Authorities

Figure 9.12 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.

Figure 9.13 - Definition of Market Data Provider

Figure 9.13 depicts a market data provider as a financial information publisher that publishes market rates.

Table 9.11 - Interest Rate Publishers Ontology Details

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 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.	Parent Class: FinancialInformationPublisher, 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

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.

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.

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/20160801/EconomicIndicators/EconomicIndicators/
sm:dependsOn	http://www.omg.org/spec/EDMC-FIBO/FND/ http://www.omg.org/spec/EDMC-FIBO/BE/

Figure 9.14 - Economic Indicators Class Hierarchy

Figure 9.14 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.
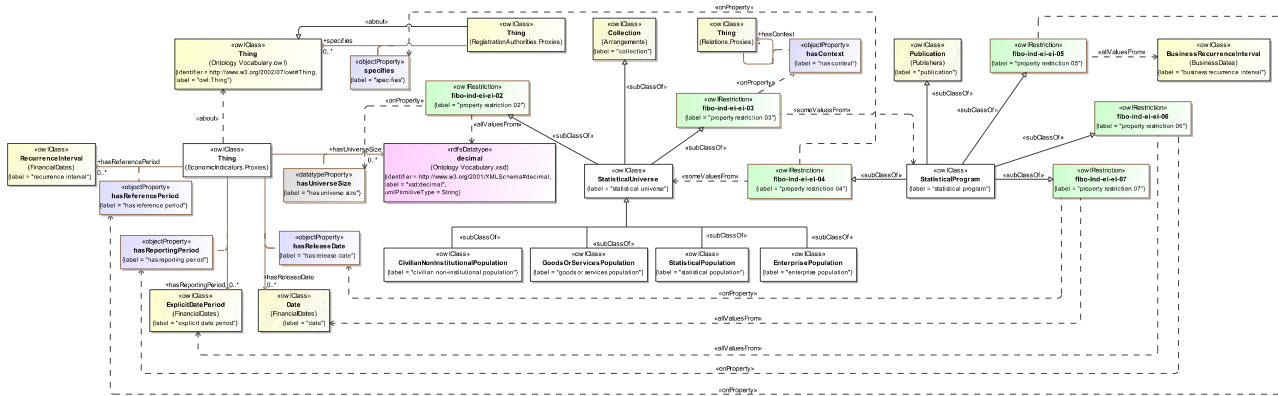
Figure 9.15 - Statistical Programs and Universes

Figure 9.15 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.
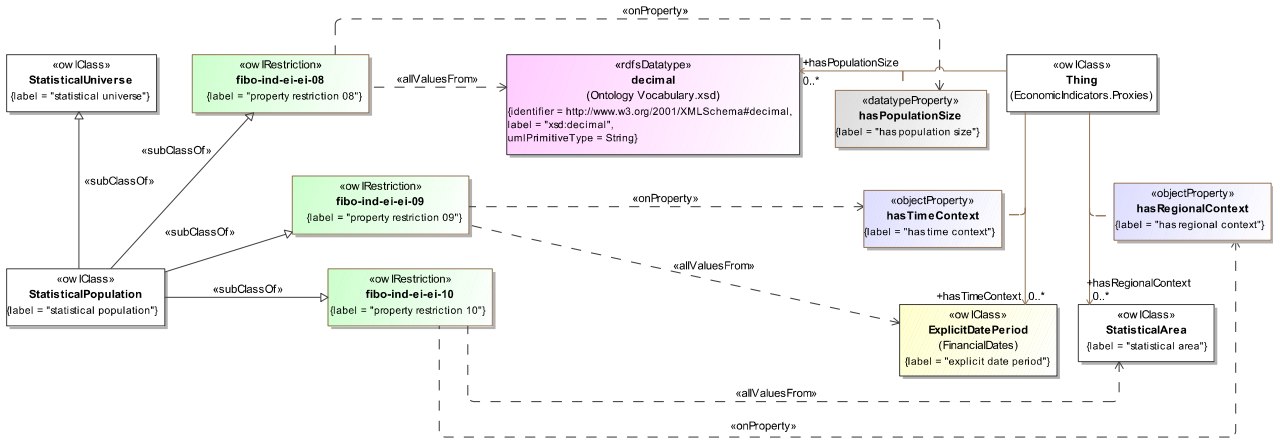
Figure 9.16 - Definition of Statistical Population

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 9.16.
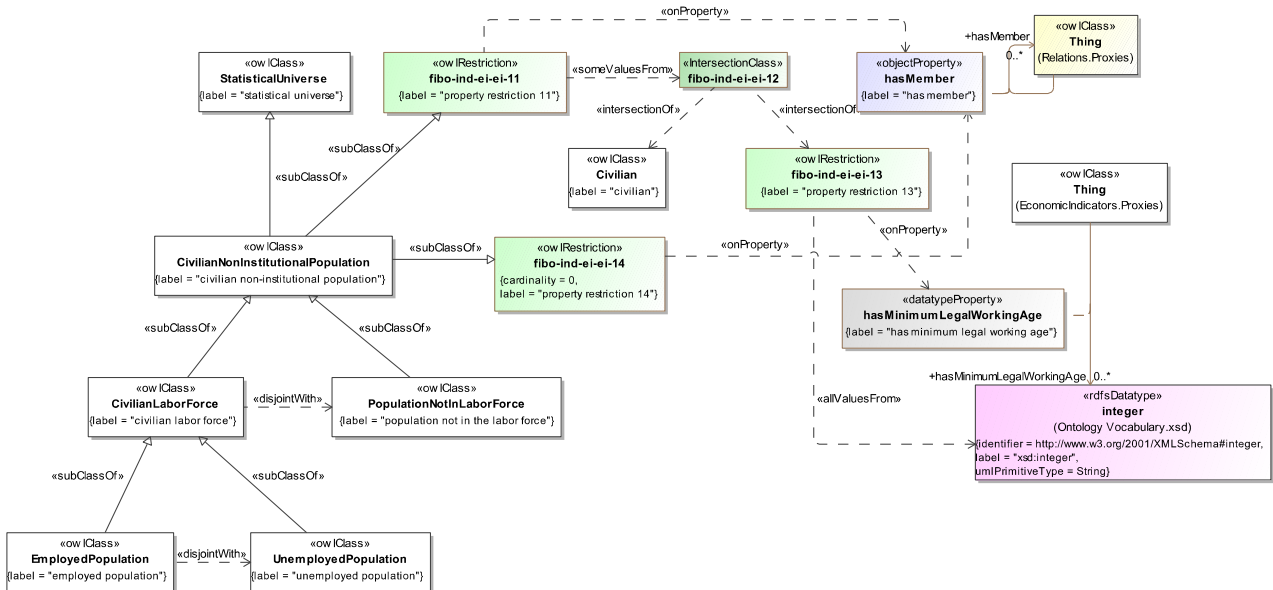
Figure 9.17 - Definition of Civilian Non-institutional Population

Figure 9.17 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.
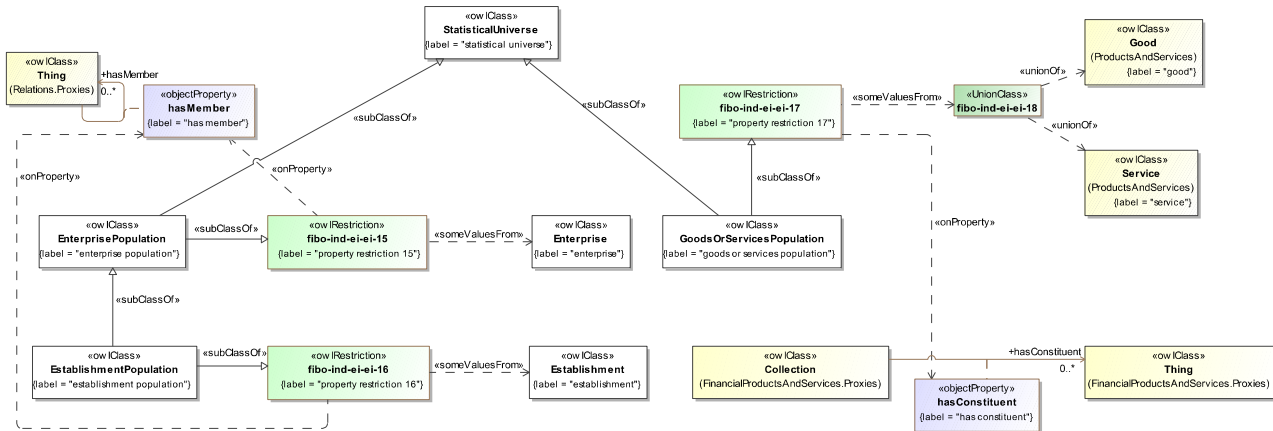
Figure 9.18 - Definition of Establishment, Enterprise, and Goods and Services Population

The populations shown in Figure 9.18 are also used as the basis for certain employment and price indices surveys.
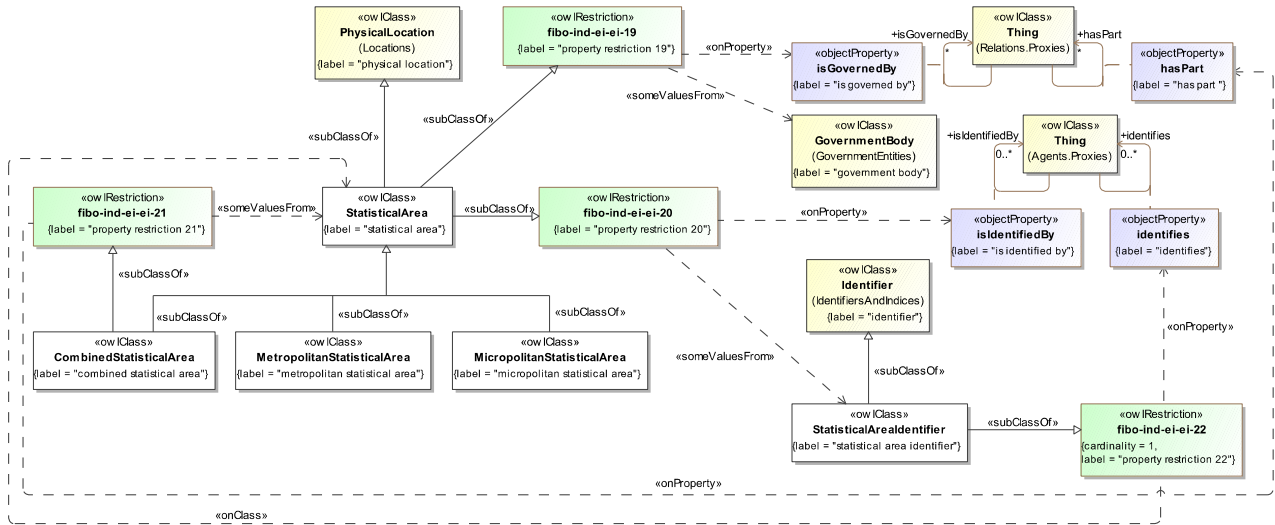
Figure 9.19 - Definition of Statistical Area

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 9.19.
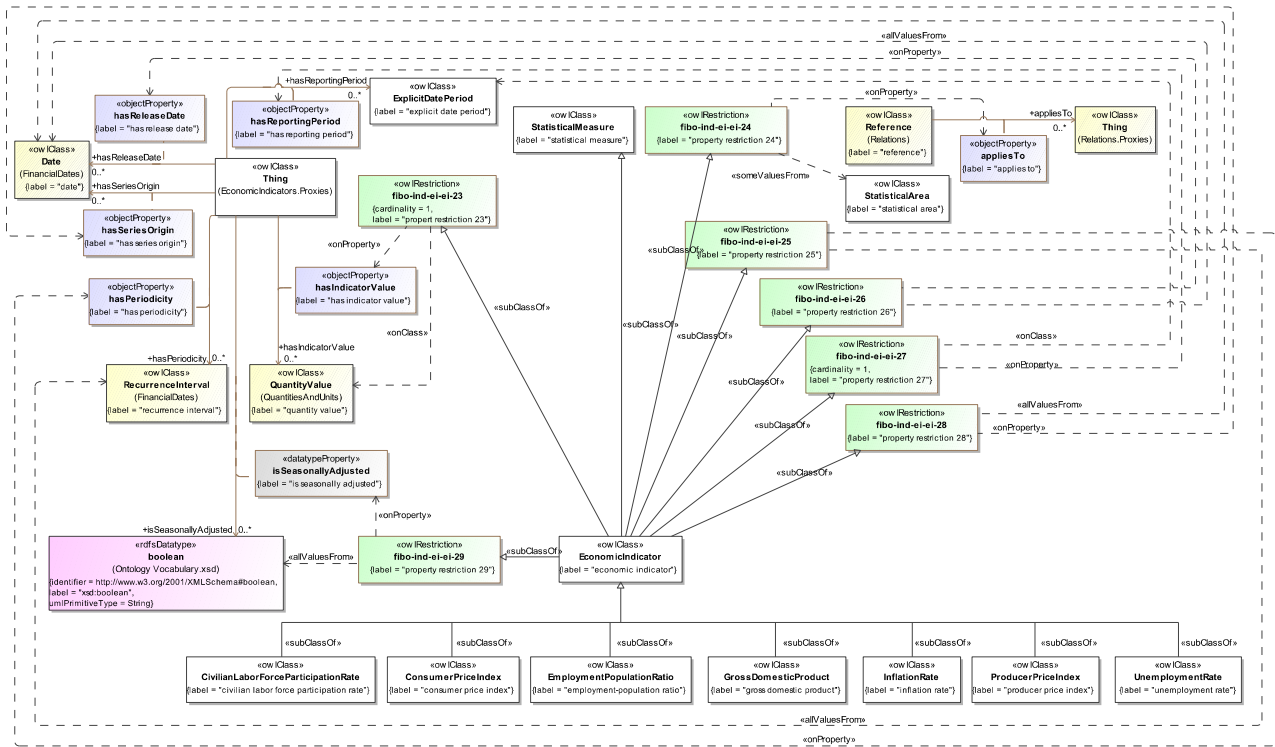
Figure 9.20 - Definition of an Economic Indicator

Figure 9.20 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.
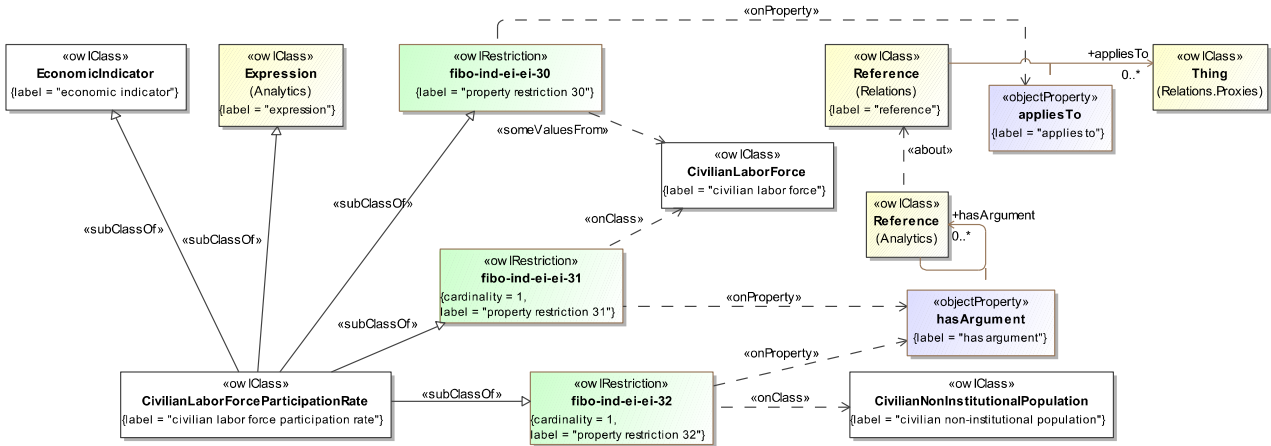
Figure 9.21 - Definition of the Civilian Labor Force Participation Rate

Figure 9.21 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.
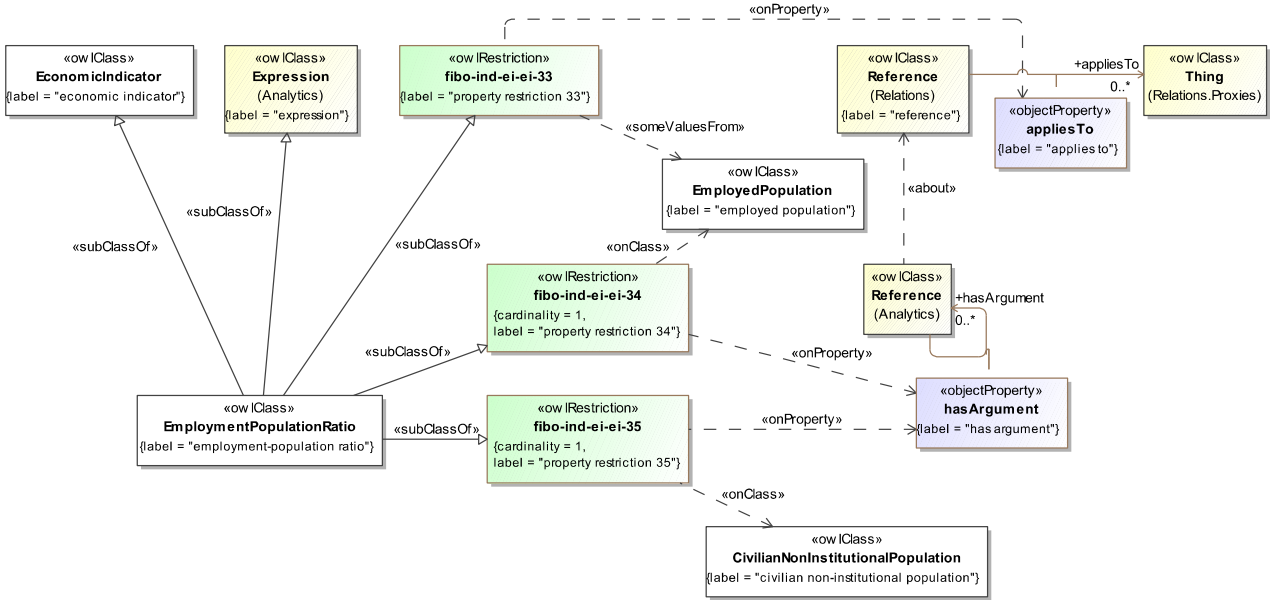
Figure 9.22 - Definition of the Employment Population Ratio

Figure 9.22 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.
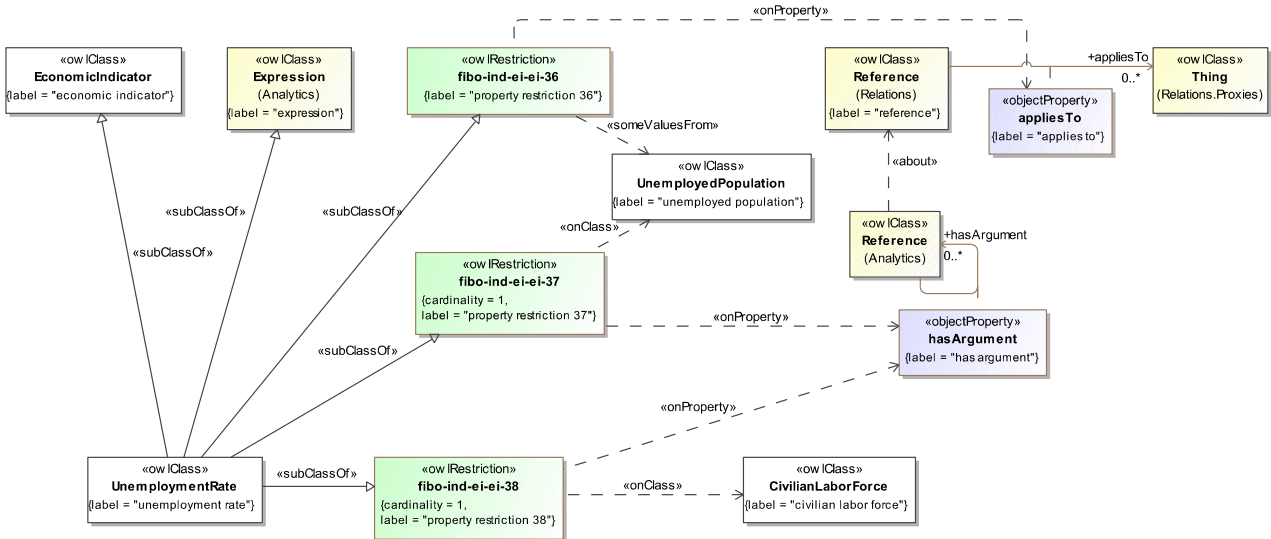
Figure 9.23 - Definition of the Unemployment Rate

Figure 9.23 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).
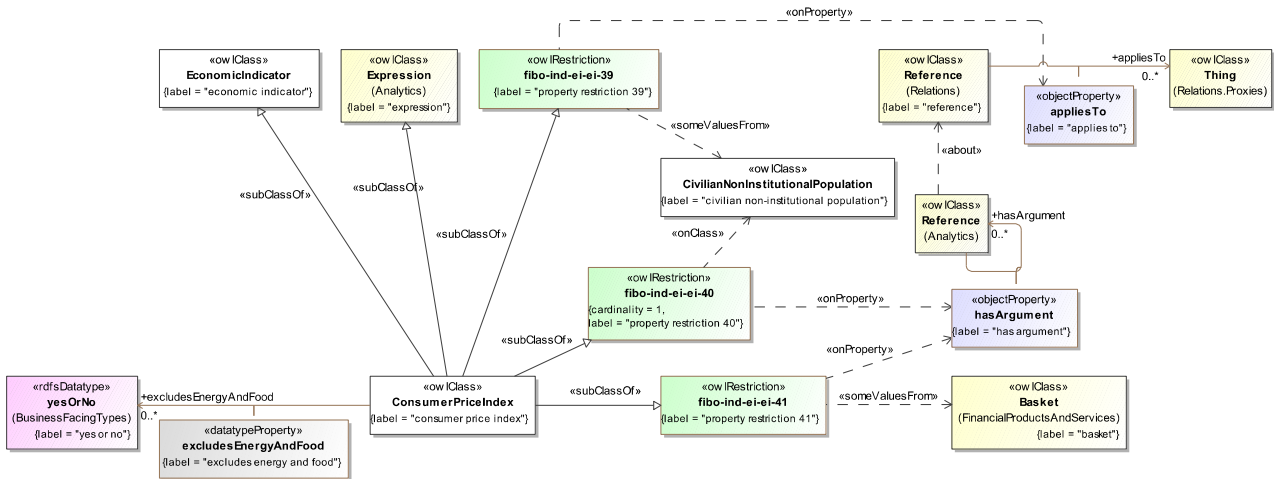
Figure 9.24 - Definition of Consumer Price Index (CPI)
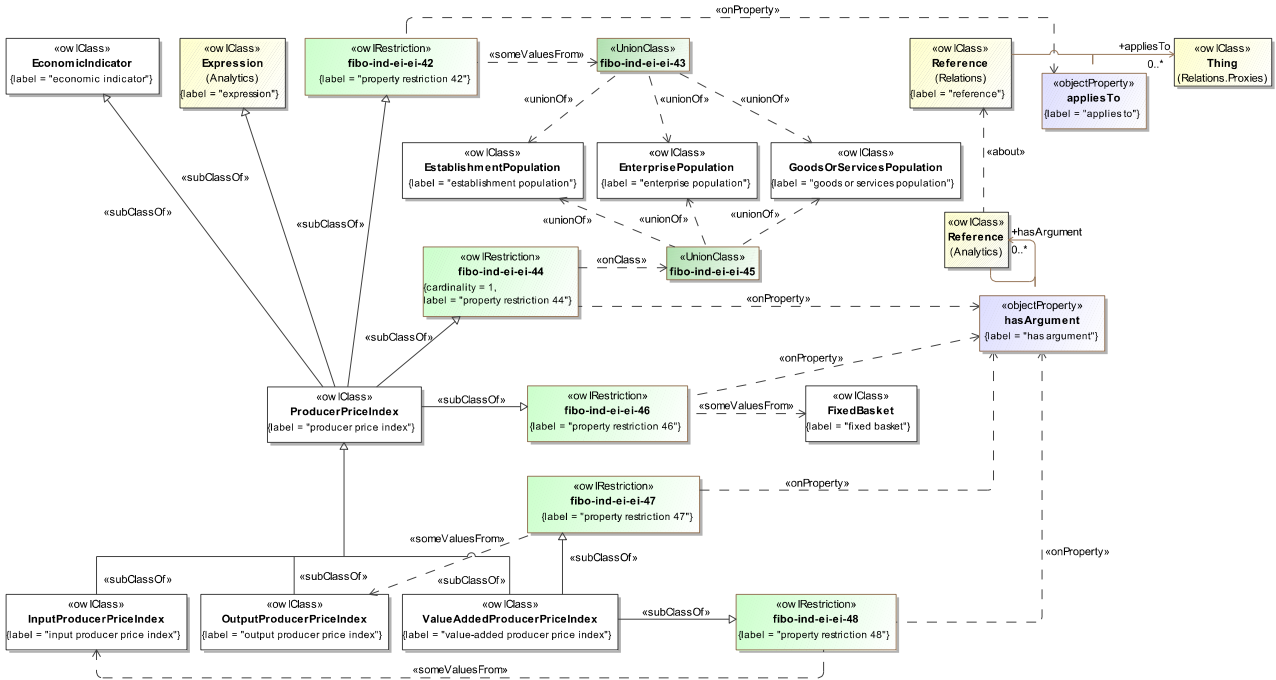
Figure 9.25 - Definition of Producer Price Index (PPI)

Figure 9.25 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.
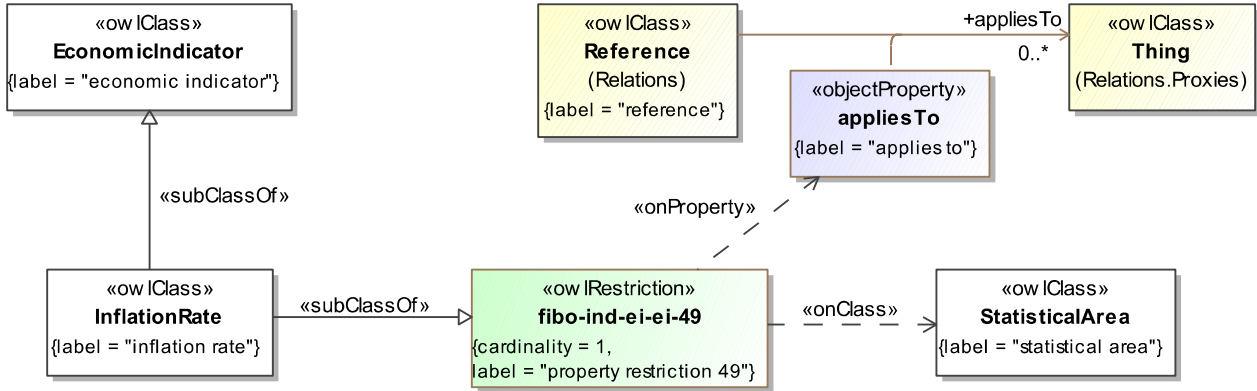
Figure 9.26 - Definition of Inflation Rate
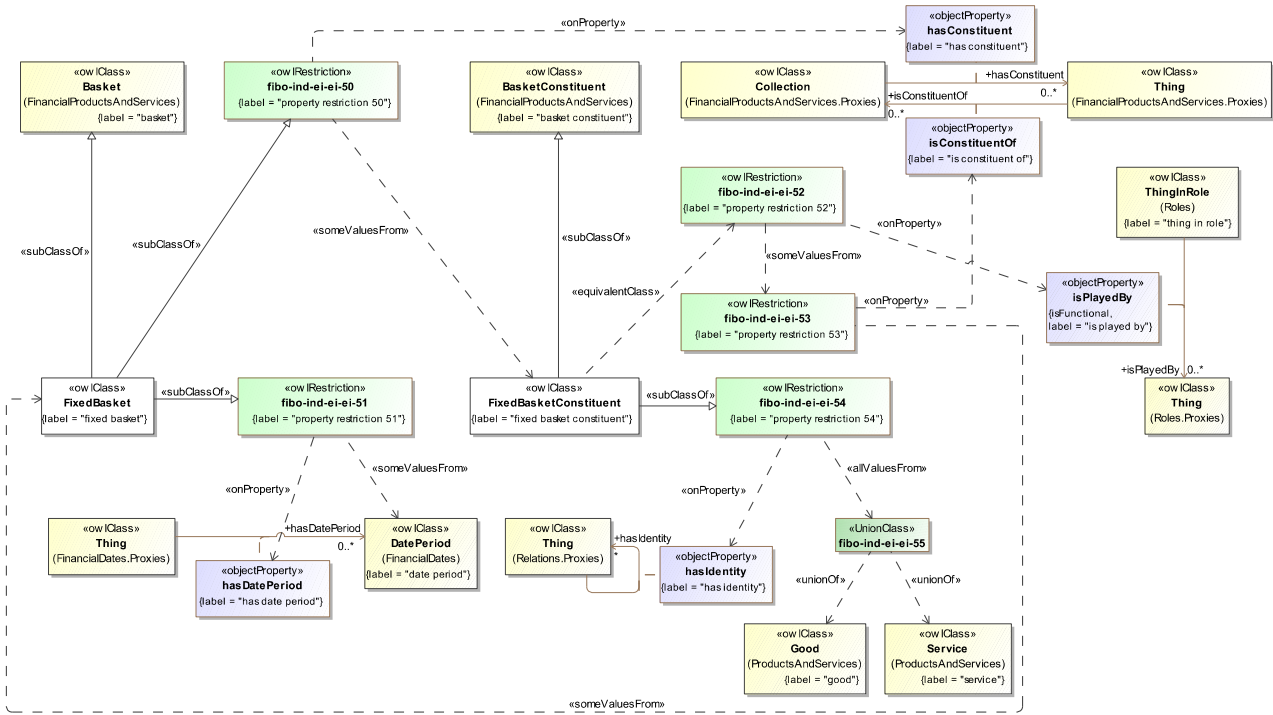
Figure 9.27 - Definition of Fixed Basket and Fixed Basket Constituent

Figure 9.27 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.
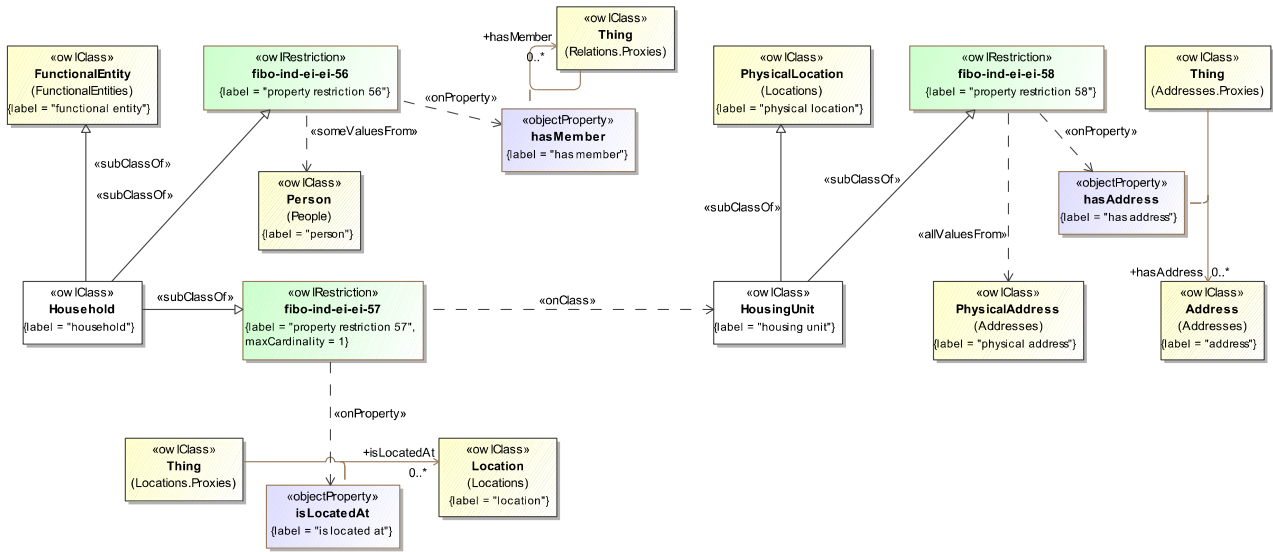
Figure 9.28 - Definition of Household and Housing Unit

Households, which are the target of certain employment and pricing surveys, are defined in Figure 9.28.
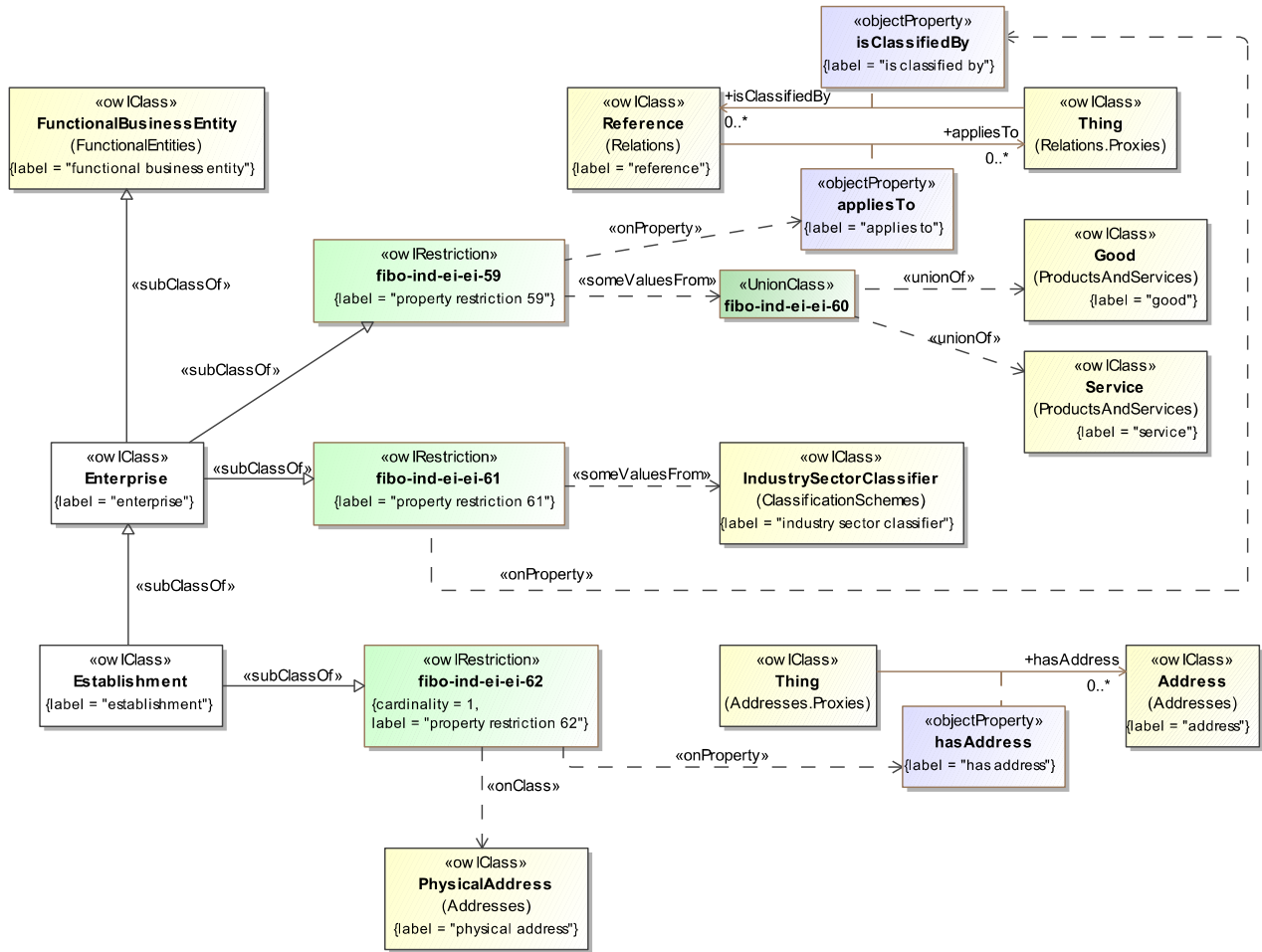
Figure 9.29 - Definition of Enterprise and Establishment

Enterprises, which are also the target of certain employment and pricing surveys, are defined in Figure 9.29. 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	Annotations	Class Expressions
Civilian (civilian)	<u>Definition</u>: a person that is not a member of the military (*i.e.*, that is not on active duty) <u>Adapted from</u>: U.S. Bureau of Labor Statistics and Statistics Canada reference definitions - <u>https://wiki.edmcouncil.org/pages/viewpage.action?pageId=6358041</u>	<u>Parent Class</u>: LegallyCapablePerson
CivilianLaborForce (civilian labor force)	<u>Definition</u>: a subset of the civilian, non-institutional population considered to be part of the labor force during a given reporting period <u>Adapted from</u>: U.S. Bureau of Labor Statistics and Statistics Canada reference definitions - <u>https://wiki.edmcouncil.org/pages/viewpage.action?pageId=6358041</u>	<u>Parent Class</u>: CivilianNonInstitutionalPopulation Class Axiom: ¬ PopulationNotInLaborForce
CivilianLaborForceParticipationRate (civilian labor force participation rate)	<u>Definition</u>: an economic indicator representing the rate of participation the labor force of a given economy for some specified period <u>Actual expression</u>: civilian labor force ÷ civilian non-institutional population <u>Explanatory note</u>: 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). <u>Adapted from</u>: <u>http://www.bls.gov/bls/cps_fact_sheets/lfp_mock.htm</u>	<u>Parent Class</u>: EconomicIndicator, Expression <u>Property Restriction</u>: ∃ **appliesTo**.**CivilianLaborForce** (fibo-ind-ei-ei-30) <u>Property Restriction</u>: = 1 **hasArgument**.**CivilianLaborForce** (fibo-ind-ei-ei-31) <u>Property Restriction</u>: = 1 **hasArgument**.**CivilianNonInstitutionalPopulation** (fibo-ind-ei-ei-32)
CivilianNonInstitutionalPopulation (civilian non-institutional population)	<u>Definition</u>: 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 <u>Scope note</u>: The civilian non-institutional population is typically reported in thousands. <u>Adapted from</u>: U.S. Bureau of Labor Statistics and Statistics Canada reference definitions - <u>https://wiki.edmcouncil.org/pages/viewpage.action?pageId=6358041</u>	<u>Parent Class</u>: StatisticalUniverse <u>Property Restriction</u>: ∃ **hasMember** (Civilian ∩ (∀ **hasMinimumLegalWorkingAge.integer**)) (fibo-ind-ei-ei-11, fibo-ind-ei-ei-12, fibo-ind-ei-ei-13) <u>Property Restriction</u>: = 0 **hasMember**.**InstitutionalPerson** (fibo-ind-ei-ei-14)

Name	Annotations	Class Expressions
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

Name	Annotations	Class Expressions
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	Parent Class: EconomicIndicator, Expression
	Adapted from: http://www.ilo.org/public/english/bureau/stat/guides/cpi/	Property Restriction: ∃ **appliesTo.CivilianNonInstitutionalPopulation** (fibo-ind-ei-ei-39)
	Adapted from: http://unstats.un.org/unsd/nationalaccount/docs/SNA2008.pdf	Property Restriction: = 1 **hasArgument.CivilianNonInstitutionalPopulation** (fibo-ind-ei-ei-40)
		Property Restriction: = 1 **hasArgument.Basket** (fibo-ind-ei-ei-41)
		Class Axiom: ¬ CivilianLaborForceParticipationRate
		Class Axiom: ¬ EmploymentPopulationRatio
		Class Axiom: ¬ GrossDomesticProduct
		Class Axiom: ¬ InflationRate
		Class Axiom: ¬ UnemploymentRate

Name	Annotations	Class Expressions
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

Name	Annotations	Class Expressions
EmploymentPopulationRatio (employment-population ratio)	Definition: an economic indicator representing the ratio of the 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	Parent Class: 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)

Name	Annotations	Class Expressions
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 constituent)	Definition: a component of a fixed basket	Parent Class: BasketConstituent 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)

Name	Annotations	Class Expressions
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

Name	Annotations	Class Expressions
Household (household)	<u>Definition</u>: 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	Parent Class: FunctionalEntity Property Restriction: ∃ **hasMember.Person** (fibo-ind-ei-ei-56) Property Restriction: = 1 **isLocatedAt.HousingUnit** (fibo-ind-ei-ei-57)
	<u>Explanatory note</u>: 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.	
	<u>Explanatory note</u>: 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 major categories of households, 'family' and 'nonfamily'.	
	<u>Adapted from</u>: http://stats.oecd.org/glossary/detail.asp?ID=1255	
	<u>Adapted from</u>: http://www.census.gov/glossary/#term_Household	

Name	Annotations	Class Expressions
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

Name	Annotations	Class Expressions
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/om b/assets/fedreg_2010/06282010_metro_standards-Complete.pdf	Parent Class: StatisticalArea
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/man ual/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

Name	Annotations	Class Expressions
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. Adapted from: https://www.imf.org/external/pubs/ft/ppi/2010/manual/ppi.pdf	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

Name	Annotations	Class Expressions
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)

Name	Annotations	Class Expressions
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)
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)

Name	Annotations	Class Expressions
ValueAddedProducerPriceIndex (value-added producer price index, value-added PPI)	<u>Definition</u>: an economic indicator representing a weighted average of the input and output producer price indices <u>Adapted from</u>: <u>https://www.imf.org/external/pubs/ft/ppi/2010/manual/ppi.pdf</u>	<u>Parent Class</u>: ProducerPriceIndex <u>Property Restriction</u>: ∃ hasArgument.InputProducerPriceIndex (fibo-ind-ei-ei-48) <u>Property Restriction</u>: ∃ hasArgument.OutputProducerPriceIndex (fibo-ind-ei-ei-47)

Properties

Name	Annotations	Property Axioms
actualExpression (actual expression)	<u>Definition</u>: the calculation or expression used to determine the value of the indicator	
hasIndicatorValue (has indicator value)	<u>Definition</u>: specifies quantity value for a given indicator	<u>Parent Property</u>: has <u>Range</u>: QuantityValue
hasPeriodicity (has periodicity)	<u>Definition</u>: specifies a recurrence interval (monthly, quarterly, annual) that an indicator reflects	<u>Parent Property</u>: hasRecurrenceInterval <u>Range</u>: RecurrenceInterval
hasReferencePeriod (has reference period)	<u>Definition</u>: specifies a reference (baseline) recurrence interval for which a given economic indicator applies	<u>Parent Property</u>: hasRecurrenceInterval <u>Range</u>: RecurrenceInterval
hasRegionalContext (has regional context)	<u>Definition</u>: specifies the regional (geopolitical) context for a given measurement, population, or economic indicator	<u>Parent Property</u>: hasContext <u>Range</u>: StatisticalArea
hasReleaseDate (has release date)	<u>Definition</u>: specifies the release date for a given economic indicator	<u>Parent Property</u>: hasDate <u>Range</u>: Date
hasReportingPeriod (has reporting period)	<u>Definition</u>: specifies the reporting period for which a given economic indicator applies	<u>Parent Property</u>: hasDatePeriod <u>Range</u>: ExplicitDatePeriod
hasSeriesOrigin (has series origin)	<u>Definition</u>: specifies the original starting date for the time series for a given economic indicator	<u>Parent Property</u>: hasStartDate <u>Range</u>: Date
hasTimeContext (has time context)	<u>Definition</u>: specifies the time context for a given measurement, population, or economic indicator	<u>Parent Property</u>: hasContext, hasDatePeriod <u>Range</u>: ExplicitDatePeriod
excludesEnergyAndFood (excludes energy and food)	<u>Definition</u>: a predicate indicating whether the index excludes energy and food prices	<u>Domain</u>: ConsumerPriceIndex <u>Range</u>: yesOrNo

Name	Annotations	Property Axioms
hasMinimumLegalWorkingAge (has minimum legal working age)	<u>Definition</u>: a predicate indicating the legal working age (minimum), in years, of people that are counted as members of the working population <u>Explanatory note</u>: 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. <u>Adapted from</u>: http://www.investopedia.com/terms/w/working-age-population.asp	<u>Range</u>: integer
hasPopulationSize (has population size)	<u>Definition</u>: a predicate indicating the number of elements in a given population	<u>Parent Property</u>: hasAmount <u>Range</u>: decimal
hasUniverseSize (has universe size)	<u>Definition</u>: a predicate indicating the number of elements in a given universe	<u>Parent Property</u>: hasAmount <u>Range</u>: decimal
isSeasonallyAdjusted (is seasonally adjusted)	<u>Definition</u>: a predicate indicating whether some published formal method is applied that compensates for seasonal variations in the population or index value <u>Explanatory note</u>: 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.	<u>Range</u>: boolean

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.

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/20160801/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/
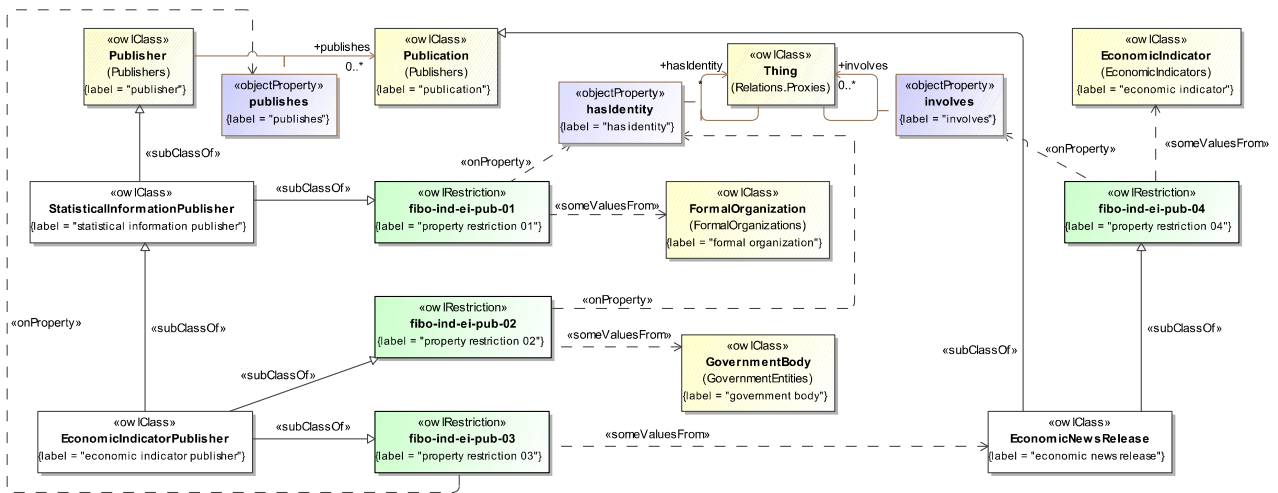
Figure 9.30 - Statistical Information and Economic Indicator Publishers

Economic indicators are statistical in nature, typically published by government organizations, as shown in Figure 9.30.

Table 9.16 - Economic Indicator Publishers Ontology Details

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 clause 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/EconomicIndicators/ http://www.omg.org/spec/EDMC-FIBO/IND/EconomicIndicators/EconomicIndicatorPublishers/

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	CAEconomicIndicators.rdf
sm:fileAbbreviation	fibo-ind-ei-caei
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/

Annex A: Machine Readable Files

(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.

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