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Financial Industry Business Ontology – Indices and Indicators

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Preface

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Times/Times New Roman - 10 pt.: Standard body text

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

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

Helvetica/Arial - 10 pt: Exceptions

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

1 Scope

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

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

1.1 Overview

This specification is part of a family of specifications called the Financial Industry Business Ontology (FIBO).

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

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

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

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

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

1.2 Scope of Financial Industry Business Ontologies: Indices and Indicators

1.2.1 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 FIBO Business Entities [FIBO BE].

1.2.2 Business Scope

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

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

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

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

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

1.2.3 Relation to Existing Market Index and Economic Indicator Standards

The model defined in this specification is a "business conceptual model" as described in Section 1.2 of the [FIBO Foundations] specification. A business conceptual model in the sense used here is one which represents things in the business domain as distinct from data descriptions for data about those things, and which does not reflect the technical constraints of any given application. As such this specification is intended to be complementary to technical standards in the financial services industry, most of which were developed and are framed (positioned) either as logical data models or as physical message schemas. For this reason this specification includes concepts which contribute towards the definition of a concept or the disambiguation of concepts without reference to whether all of these individual properties would be used within a physical application.

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

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

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

1.3 Definitions

The human readable definitions have been constructed by and with the input of business subject matter experts.

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

1.3.1. Definitions Policy

Many definitions in this specification were initially derived from terms given in the ISO 20022 FIBIM model, with adaptations to the definitions text where necessary to re-frame the definition from that of a data element, field or table to the definition of the thing in the world to which the FIBO concept refers. The exceptions to this approach are where additional concepts were added during industry subject matter expert reviews; in these cases the definition has been arrived at through consensus of the financial industry subject matter experts participating in those reviews. The policy which follows is given for FIBO specifications in general but has not needed to be called upon for this specification.

Where definitions for the FIBO industry terms are derived from third party sources, 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, definitions will be sourced from US government sites, including the US Federal Reserve Bank of NY, and the Bureau of Labor and Statistics (BLS), as appropriate.

2. 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

Audience: Technical, semantic technology and standards audiences.

2.1 Applications for which Conformance Points Exist

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

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

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

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

2.2 Conformance Points

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

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

2.3 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 version 1.1. Anticipated Summer 2014 at http://www.omg.org/spec/DTV/1.1/
[FIBO BE]	Financial Industry Business Ontology (FIBO) – Business Entities (EDMC-FIBO/BE). Available at http://www.omg.org/spec/EDMC-FIBO/BE/
[FIBO Foundations]	Financial Industry Business Ontology (FIBO) – Foundations (EDMC-FIBO/FND). Available at http://www.omg.org/spec/EDMC-FIBO/FND/
[ISO 1087]	ISO 1087-1:2000 Terminology — Vocabulary — Part 1: Theory and application
[MOF Core]	Meta Object Facility (MOF™) Core, v2.4.2. Available at http://www.omg.org/spec/MOF/2.4.2/.
[MOF XMI]	MOF 2/XMI (XML Metadata Interchange) Mapping Specification, v2.4.2. Available at http://www.omg.org/spec/XMI/2.4.2/.
[ODM 1.1]	Ontology Definition Metamodel (ODM), v1.1. Available at http://www.omg.org/spec/ODM/1.1/.
[OMG AB Specification Metadata]	OMG Architecture Board recommendations for specification of ontology metadata, Available at http://www.omg.org/techprocess/ab/20130701/SpecificationMetadata.rdf
[OWL 2]	OWL 2 Web Ontology Language Quick Reference Guide (Second Edition), W3C Recommendation 11 December 2012. Available at http://www.w3.org/TR/2012/REC-owl2-quick-reference-20121211/.
[RDF 1.1]	RDF 1.1 Concepts and Abstract Syntax, W3C Proposed recommendation available at http://www.w3.org/TR/2013/WD-rdf11-concepts-20130723/
[RDF Concepts]	Resource Description Framework (RDF): Concepts and Abstract Syntax. Graham Klyne and Jeremy J. Carroll, Editors. W3C Recommendation, 10 February 2004. Latest version is available at http://www.w3.org/TR/rdf-concepts/.
[RDF Schema]	RDF Vocabulary Description Language 1.0: RDF Schema. Dan Brickley and R.V. Guha, Editors. W3C Recommendation, 10 February 2004. Latest version is available at http:// www.w3.org/TR/rdf-schema/.
[SKOS]	SKOS Simple Knowledge Organization System Reference, W3C Recommendation 18 August 2009. Available at http://www.w3.org/TR/2009/REC-skos-reference-20090818/.
[UML2]	Unified Modeling Language™ (UML®), version 2.4.1. Available at http://www.omg.org/spec/UML/2.4.1/.
[Unicode]	*The Unicode Standard, Version 3*, The Unicode Consortium, Addison-Wesley, 2000. ISBN 0-201-61633-5, as updated from time to time by the publication of new versions. (See http:// www.unicode.org/unicode/standard/versions/ for the latest version and additional information on versions of the standard and of the Unicode Character Database).
[UTF-8]	RFC 3629: UTF-8, a transformation format of ISO 10646. F. Yergeau. IETF, November 2003, http://www.ietf.org/rfc/rfc3629.txt
[W3C Datatypes in RDF and OWL]	XML Schema Datatypes in RDF and OWL, W3C Working Group Note 14 March 2006, Available at http://www.w3.org/TR/2006/NOTE-swbp-xsch-datatypes-20060314/.
[XML Schema Datatypes]	XML Schema Part 2: Datatypes. W3C Recommendation 28 October 2004. Latest version is available at http://www.w3.org/TR/xmlschema-2/.

3.2 Non Normative References

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

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

4 Terms and Definitions

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

Content

Definition: Subject matter

Business conceptual model

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

Ontology

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

Operational Ontology

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

Subject matter

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

Taxonomy

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

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 How to Read this Specification

6.1.1 Audience

This specification has the following audiences:

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

6.1.1.1 Standards Community

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

6.1.1.2 The Finance Industry Business Community

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

6.1.1.3 The Regulatory Community

As for Finance Industry Business Community.

6.1.1.4 Technical Architects

These include but are not limited to:

- Tooling vendors and developers
- Other content providers / enriched content providers
- Business Analysts – anyone who uses the model whether they are a modeler, a metadata analyst, etc.
- Technology Management

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

6.1.1.5 Semantic Modelers

Much of the material in this specification is intended to be read and understood by semantic modelers. This includes the 'Conformance' chapter (Chapter 2) and the 'Architecture' chapter (Chapter 8).

6.2 Acknowledgements

The following organization submitted this specification:

- Enterprise Data Management Council

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

- Adaptive Inc.
- Australia and New Zealand Banking Group
- AVOX/DTCC
- Bank of America
- Barclays Capital
- BBH
- Bloomberg
- Business Semantics
- CIBC
- Citigroup Inc.
- Credit Suisse Group AG
- CUSIP
- The Federal National Mortgage Association (Fannie Mae)
- David Frankel Consulting
- FacetApp
- Fidelity
- GoldenSource Corporation
- HSBC Holdings plc
- JPMorgan Chase & Co.

- The Manufacturers Life Insurance Company
- Michigan State University
- Model Driven Solutions
- Model Systems
- Morgan Stanley
- MphasiS
- National Australia Bank
- No Magic
- Nomos Software
- Nordea Bank
- Oakland University
- OntoAge
- OpenFinance
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- State Street
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- SWIFT
- Tahoe Blue
- Thematix Partners LLC
- Thomson Reuters
- UBS AG
- University of British Columbia
- University College Cork
- Wells Fargo
- Wizdom Systems, Inc.

7 Introduction

7.1 Audiences

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

7.1.1 Audience for this Section

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

7.1.2 Reading this Standard

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

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

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

7.2 Specification Overview

7.2.1 Non Technical Overview

Audience: Business.

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

7.2.2 Technical Overview

Audience: Technical architects.

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

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

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

7.3 Business Usage Scenarios

7.3.1 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.

8 Architecture

Intended Audiences: Technologists, Semantic Technologists, Standards Implementers.

8.1 Overview

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

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

8.2 The Foundations Models

This specification makes reference to specific sets of concepts in the [FIBO Foundations] specification.

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

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

8.3 Ontology Architecture and Namespaces

As described in the [FIBO Foundations] specification in section 8.2, the ontology architecture for FIBO is designed to facilitate reuse and ontology evolution to the degree possible. An important goal of this specification is to provide the foundational terminology, including basic terminology describing amounts and rates, which provides high-level, abstract conceptual knowledge intended to facilitate mapping. The basic building blocks for the Indices and Indicators (IND) Ontology, building on the architecture provided in [FIBO Foundations], are shown in Figure 8.1, below.

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

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

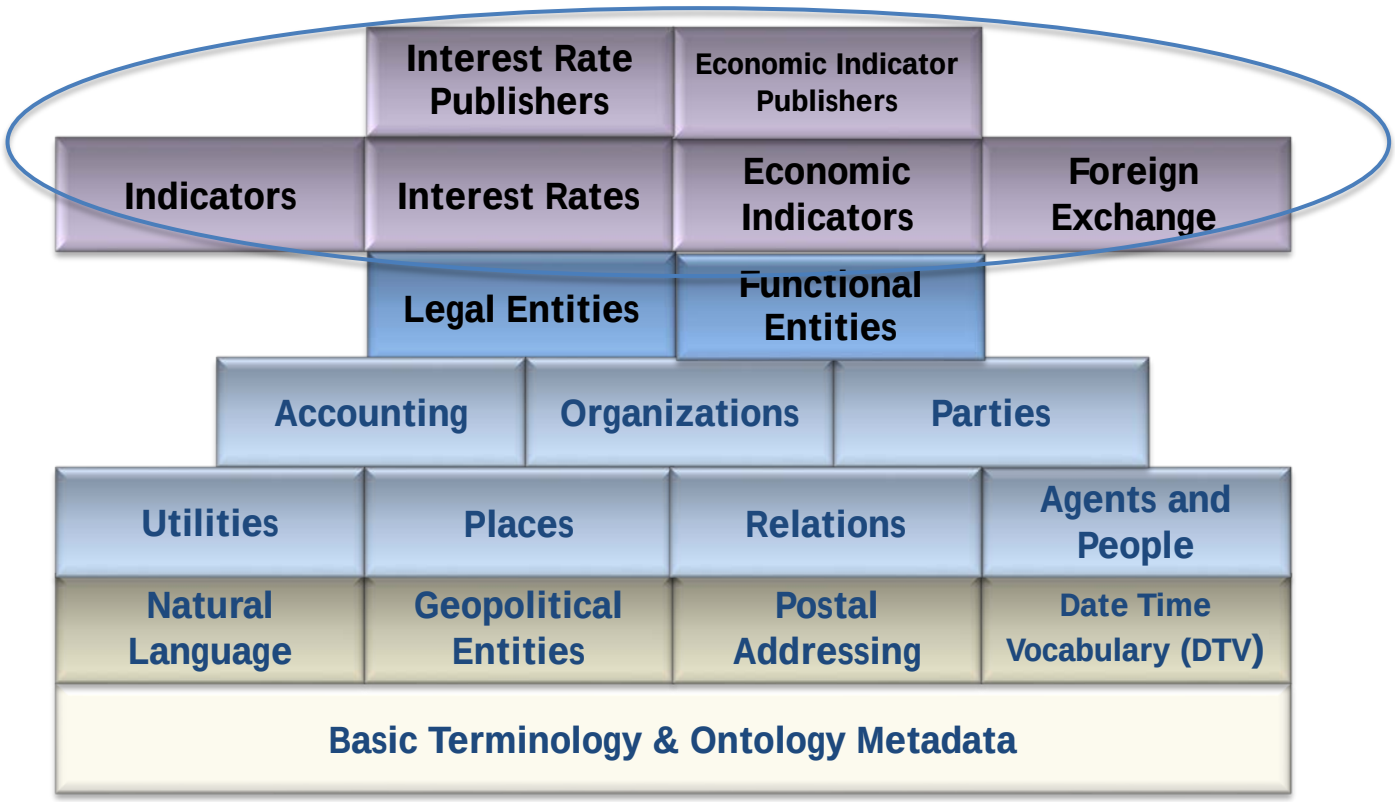

Figure 8.1 Indices and Indicators Ontology Architecture

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

Table 8.1 Prefix and Namespaces for referenced/external vocabularies

Namespace Prefix	Namespace
rdf	http://www.w3.org/1999/02/22-rdf-syntax-ns#
rdfs	http://www.w3.org/2000/01/rdf-schema#
owl	http://www.w3.org/2002/07/owl#
xsd	http://www.w3.org/2001/XMLSchema#
dct	http://purl.org/dc/terms/
skos	http://www.w3.org/2004/02/skos/core#
sm	http://www.omg.org/techprocess/ab/SpecificationMetadata/

Table 8.2 Prefix and Namespaces for FIBO Foundations

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

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

Table 8.3 Prefix and Namespaces for FIBO Business Entities

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

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

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

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

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

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

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

Table 8.4 Prefix and Namespaces for FIBO Indices and Indicators

Namespace Prefix	Namespace
fibo-ind-ind-ind	**http://www.omg.org/spec/EDMC-FIBO/IND/Indicators/Indicators/**
fibo-ind-fx-fx	**http://www.omg.org/spec/EDMC-FIBO/IND/ForeignExchange/ForeignExchange/**
fibo-ind-ir-ir	**http://www.omg.org/spec/EDMC-FIBO/IND/InterestRates/InterestRates/**
fibo-ind-ir-pub	**http://www.omg.org/spec/EDMC-FIBO/IND/InterestRates/InterestRatePublishers/**
fibo-ind-ei-ei	**http://www.omg.org/spec/EDMC-FIBO/IND/EconomicIndicators/EconomicIndicators/**
fibo-ind-ei-pub	**http://www.omg.org/spec/EDMC-FIBO/IND/EconomicIndicators/EconomicIndicatorPublishers/**

9 Model Content Reports

9.1 Overview

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

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

9.1.1 Interpreting This Section

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

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

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

9.2. Module: Indicators

Table 9.1 Indicators Module Metadata

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

9.2.1 Ontology: Indicators

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

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/20150501/Indicators/Indicators/
sm:dependsOn	http://www.omg.org/spec/EDMC-FIBO/FND/ http://www.omg.org/spec/EDMC-FIBO/BE/

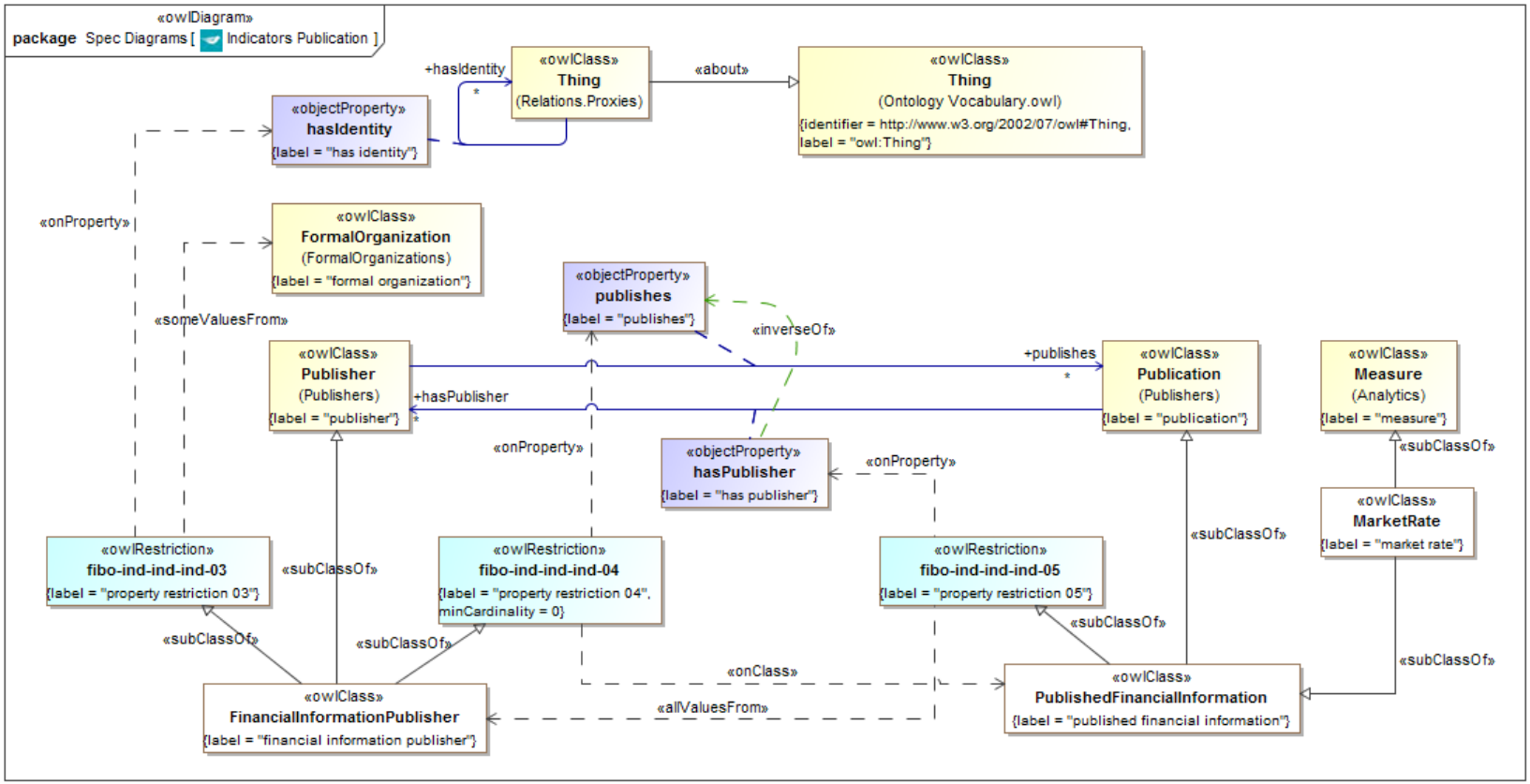

Figure 9.1 Indicators Publication Concepts

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

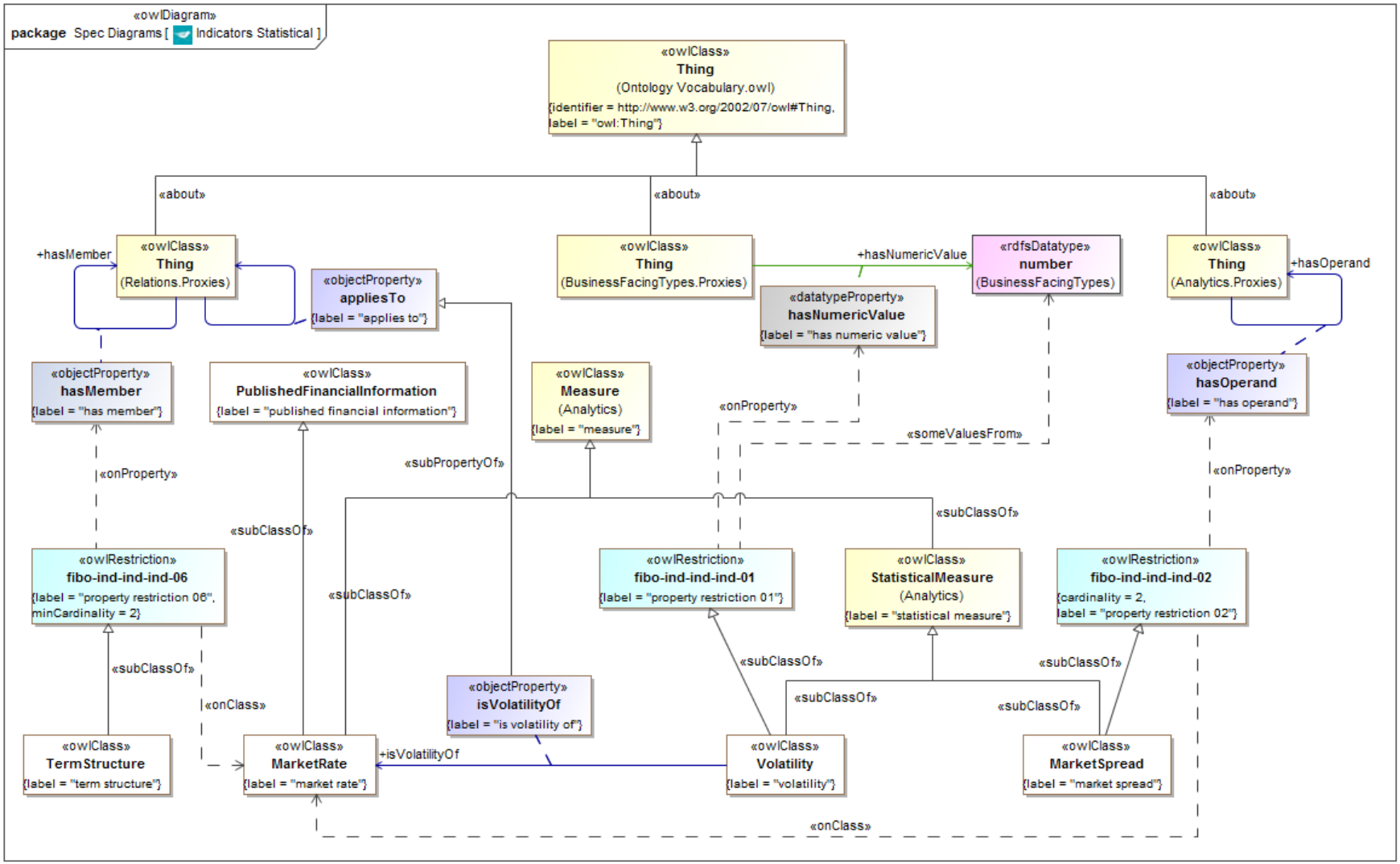

Figure 9.2 Indicators Analytical Concepts

Diagram showing the analytical or statistical types of indicator concept in the Indicators ontology.

Table 9.3 Indicators Details

Classes

Name	Label	Definition	Parent	Explanatory Note
FinancialInformation Publisher	financial information publisher	a formal organization acting as a publisher or provider of information related to the financial markets or of interest to financial market participants such as information on economies.	property restriction 04 property restriction 03 publisher	
MarketRate	market rate	a measure that is also published financial information providing a rate used to measure market trends for a set of instruments (S&P500, NASDAQ composite, 30 day CD) or that describes the economic climate for an industry (DowJones Industrial, H&Q Growth Technologies) and/or political region (Libor, Prime)	measure published financial information	
MarketSpread	market spread	a statistical measure providing the difference (or spread) between two market rates.	statistical measure property restriction 02	
PublishedFinancialInformation	published financial information	published information made available by a financial information publisher	property restriction 05 publication	
TermStructure	term structure	two or more related instruments with different terms to maturity, such that a yield curve may be constructed for the structure	property restriction 06	
Volatility	volatility	a statistical measure of the rate of change in pricing for a given security or market index	statistical measure property restriction 01	Volatility can be determined using the standard deviation or variance among prices for the security or

Name	Label	Definition	Parent	Explanatory Note
				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.

Properties for Volatility

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

Restrictions

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

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/20150501/ForeignExchange/ForeignExchange/
sm:dependsOn	http://www.omg.org/spec/EDMC-FIBO/FND/ http://www.omg.org/spec/EDMC-FIBO/IND/Indicators/Indicators/

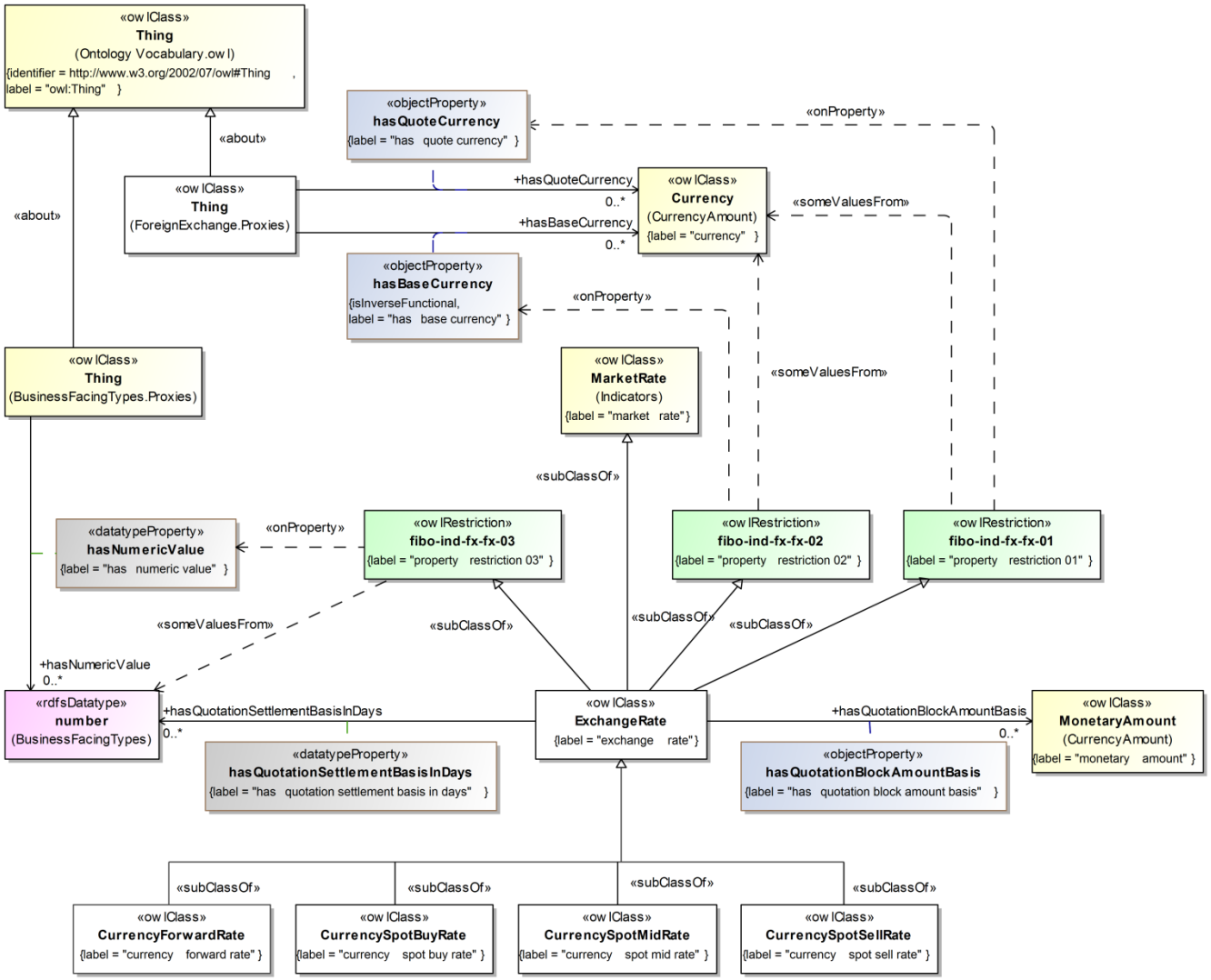

Figure 9.3 Foreign Exchange: Exchange Rate Concepts

Diagram showing the basic concepts in the Foreign Exchange ontology.

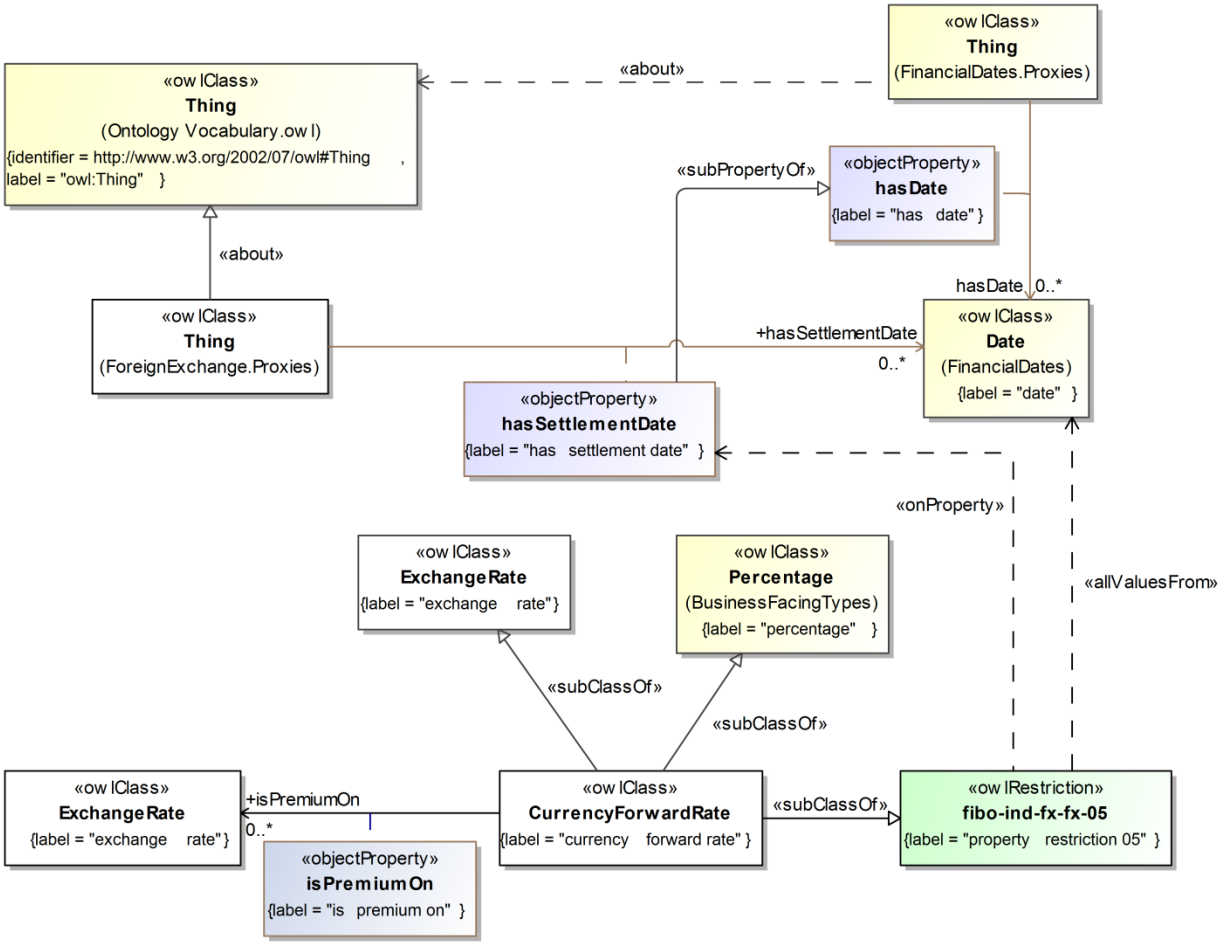

Figure 9.4 Foreign Exchange: Forward Rate Concepts

Diagram showing forward rate concepts in the Foreign Exchange ontology.

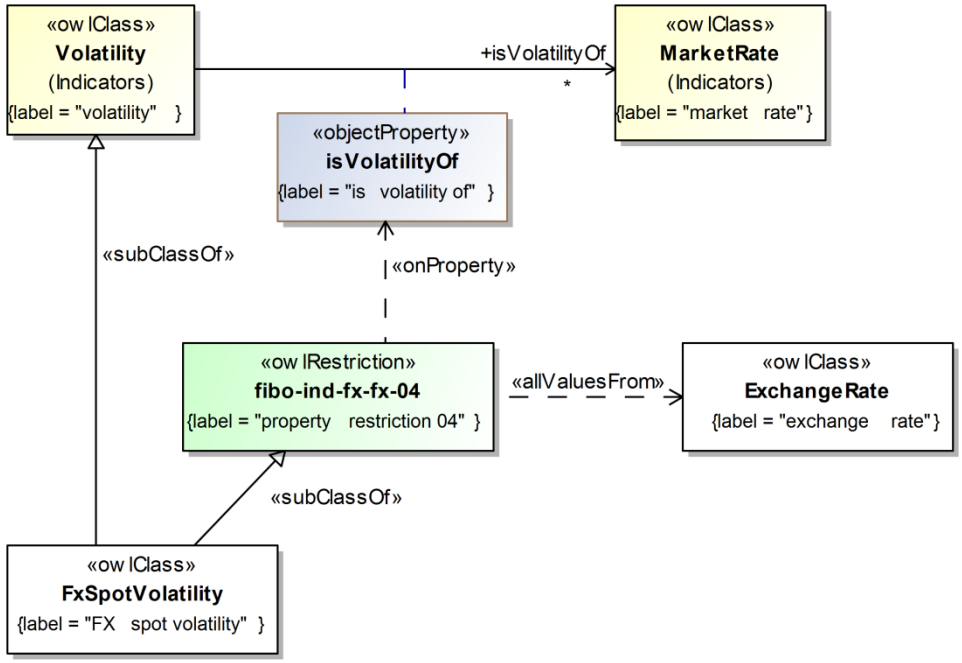

Figure 9.5 Foreign Exchange: Spot Volatility Concepts

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

Table 9.6 Foreign Exchange Details

Classes

Name	Label	Definition	Parent	Explanatory Note
CurrencyForwardRate	currency forward rate	a rate of exchange between two currencies for settlement at some future point in time, expressed as a premium on the spot rate	property restriction 05 exchange rate percentage	

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

Properties

Name	Label	Domain	Range	Definition	Explanatory Note
hasBaseCurrency	has base currency		currency	a predicate indicating the base currency in an exchange rate; one unit of this currency represents R units of the dealt currency, where R is the exchange rate value	

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

Restrictions

Name	Label	Expressions
fibo-ind-fx-fx-01	property restriction 01	hasQuoteCurrency some Currency
fibo-ind-fx-fx-02	property restriction 02	hasBaseCurrency some Currency
fibo-ind-fx-fx-03	property restriction 03	hasNumericValue some number

fibo-ind-fx-fx-04	property restriction 04	isVolatilityOf only ExchangeRate
fibo-ind-fx-fx-05	property restriction 06	hasSettlementDate only Date

9.4 Module: Interest Rates

Table 9.7 Interest Rates Module Metadata

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

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/20150501/InterestRates/InterestRates/
sm:dependsOn	http://www.omg.org/spec/EDMC-FIBO/FND/ http://www.omg.org/spec/EDMC-FIBO/IND/Indicators/Indicators/

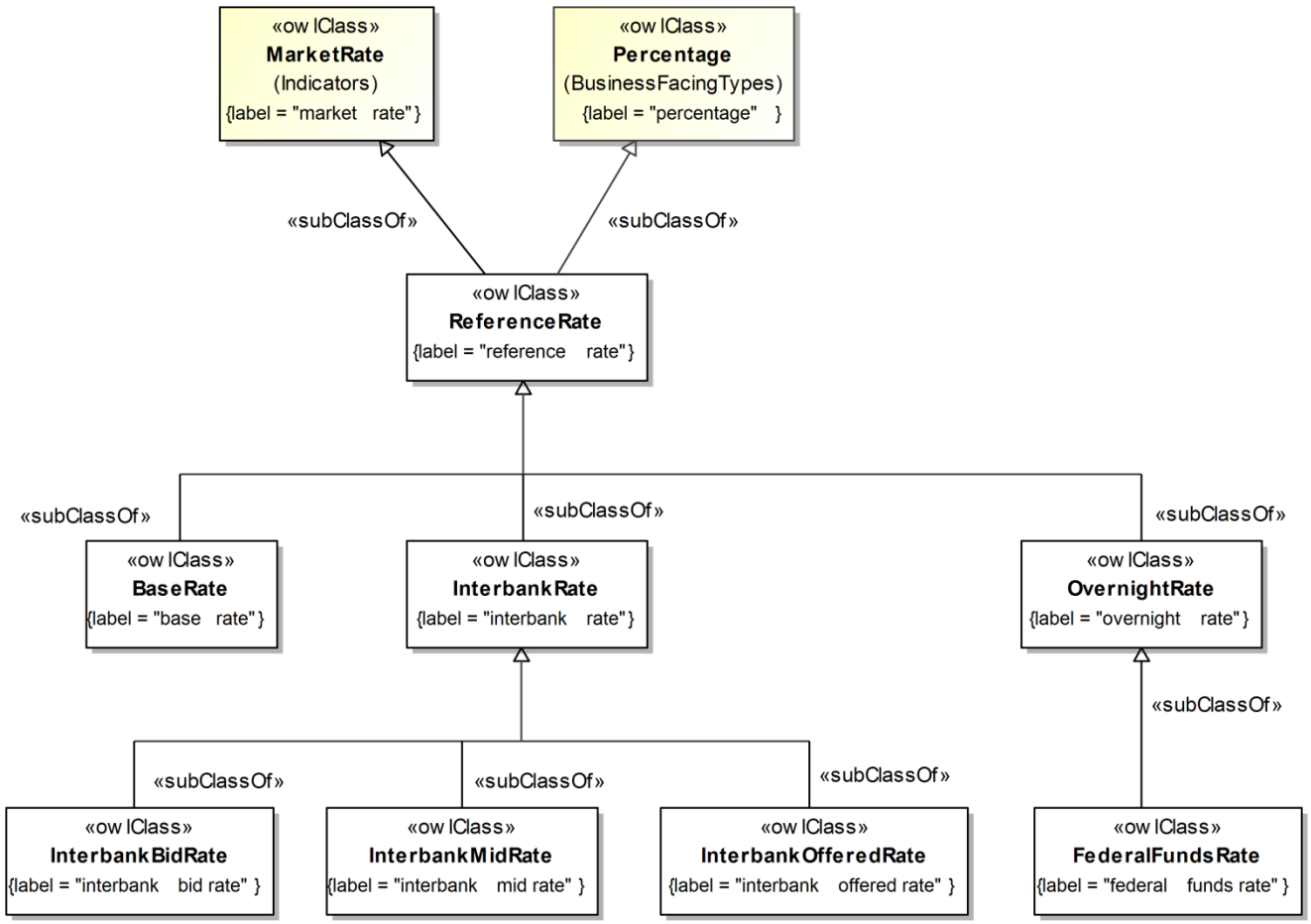

Figure 9.6 Interest Rates Concepts

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

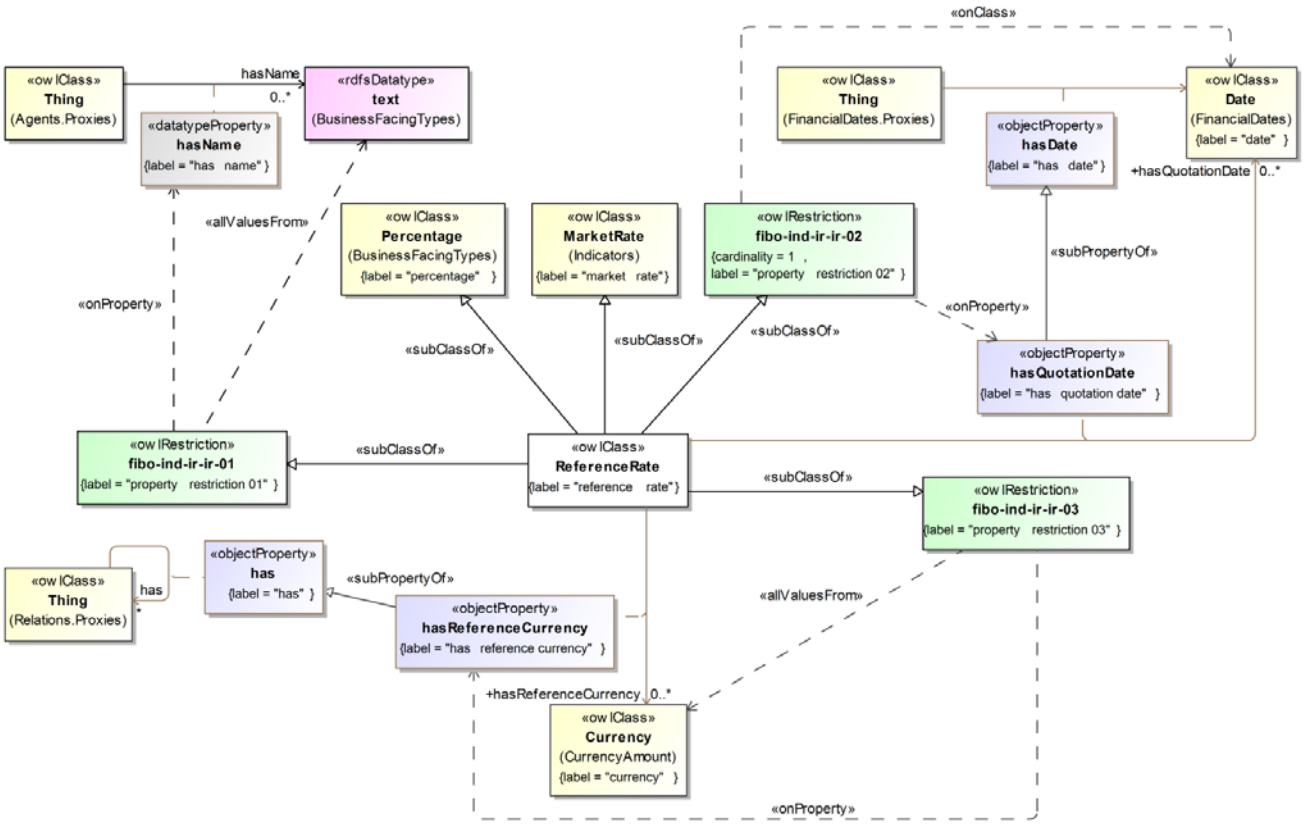

Figure 9.7 Reference Rate Definition

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

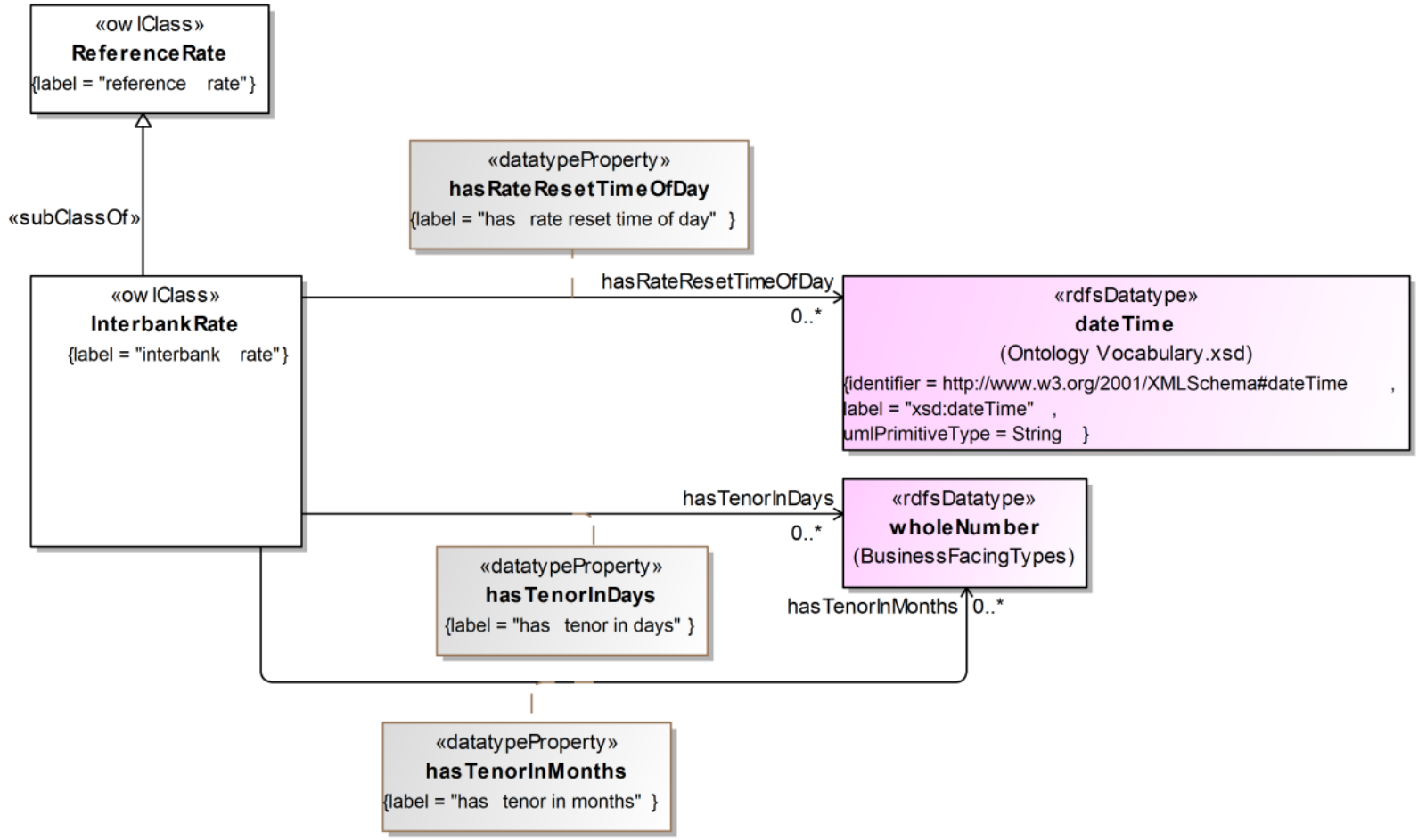

Figure 9.8 Interbank Rates Definition

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

Table 9.9 Interest Rates Details

Classes

Name	typeOfThing	definition	parent	explanatoryNote
ReferenceRate	reference rate	a market rate that is a rate of interest paid by or agreed among some bank or set of banks	property restriction 03 property restriction 02 property restriction 01 market rate, percentage	The reference rate is a moving index such as LIBOR, the prime rate or the rate on benchmark U.S. Treasuries.
OvernightRate	overnight rate	a reference rate that is an interest rate at which a depository institution lends funds to another depository institution (short-term), or the interest rate the central bank charges a financial institution to borrow money overnight	reference rate	The overnight rate is the lowest available interest rate, and as such, it is only available to the most creditworthy institutions. It is the underlying rate for Overnight Interest Rate Swaps (IOS).
InterbankRate	interbank rate	a reference rate that is the rate of interest charged on short-term loans between banks	reference rate	Banks borrow and lend money in the interbank market in order to manage liquidity and meet the requirements placed on them. The interest rate charged depends on the availability of money in the market, on prevailing rates and on the specific terms of the contract, such as term length.
InterbankOfferedRate	interbank offered rate	an interbank rate that is the interest rate at which participating banks lend money	interbank rate	
InterbankMidRate	interbank mid rate	an interbank rate that represents the mid-point between bid and offer rates	interbank rate	

Name	typeOfThing	definition	parent	explanatoryNote
InterbankBidRate	interbank bid rate	an interbank rate that is the interest rate at which participating banks are willing to borrow deposits from other banks	interbank rate	Unlike an interbank offered rate, which is the rate at which banks lend money, an interbank bid rate is the rate at which banks ask to borrow.
FederalFundsRate	federal funds rate, US federal funds rate, fed funds rate	a reference rate that is the interest rate at which a depository institution lends funds maintained at the Federal Reserve to another depository institution overnight.	overnight rate	By trading government securities, the New York Fed affects the federal funds rate, which is the interest rate at which depository institutions lend balances to each other overnight. The Federal Open Market Committee establishes the target rate for trading in the federal funds market. The federal funds rate is generally only applicable to the most creditworthy institutions when they borrow and lend overnight funds to each other. The federal funds rate is one of the most influential interest rates in the U.S. economy, since it affects monetary and financial conditions, which in turn have a bearing on key aspects of the broad economy including employment, growth and inflation. The Federal Open Market Committee (FOMC), which is the Federal Reserve's primary monetary policymaking body, telegraphs its desired target for the federal funds rate through open market operations.
BaseRate	base rate	a reference rate that is the base rate set by a central bank for a given currency	reference rate	This is set at intervals.

Properties

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

Restrictions

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

9.4.2 Ontology: Interest Rate Publishers

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

Table 9.10 Interest Rate Publishers Ontology Metadata

Metadata Term	Value
sm:filename	InterestRatePublishers
sm:fileAbbreviation	fibo-ind-ir-pub
OntologyIRI	http://www.omg.org/spec/EDMC-FIBO/IND/InterestRates/InterestRatePublishers/
owl:versionIRI	http://www.omg.org/spec/EDMC-FIBO/IND/20150501/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/IND/Indicators/Indicators/ http://www.omg.org/spec/EDMC-FIBO/IND/InterestRates/InterestRates/

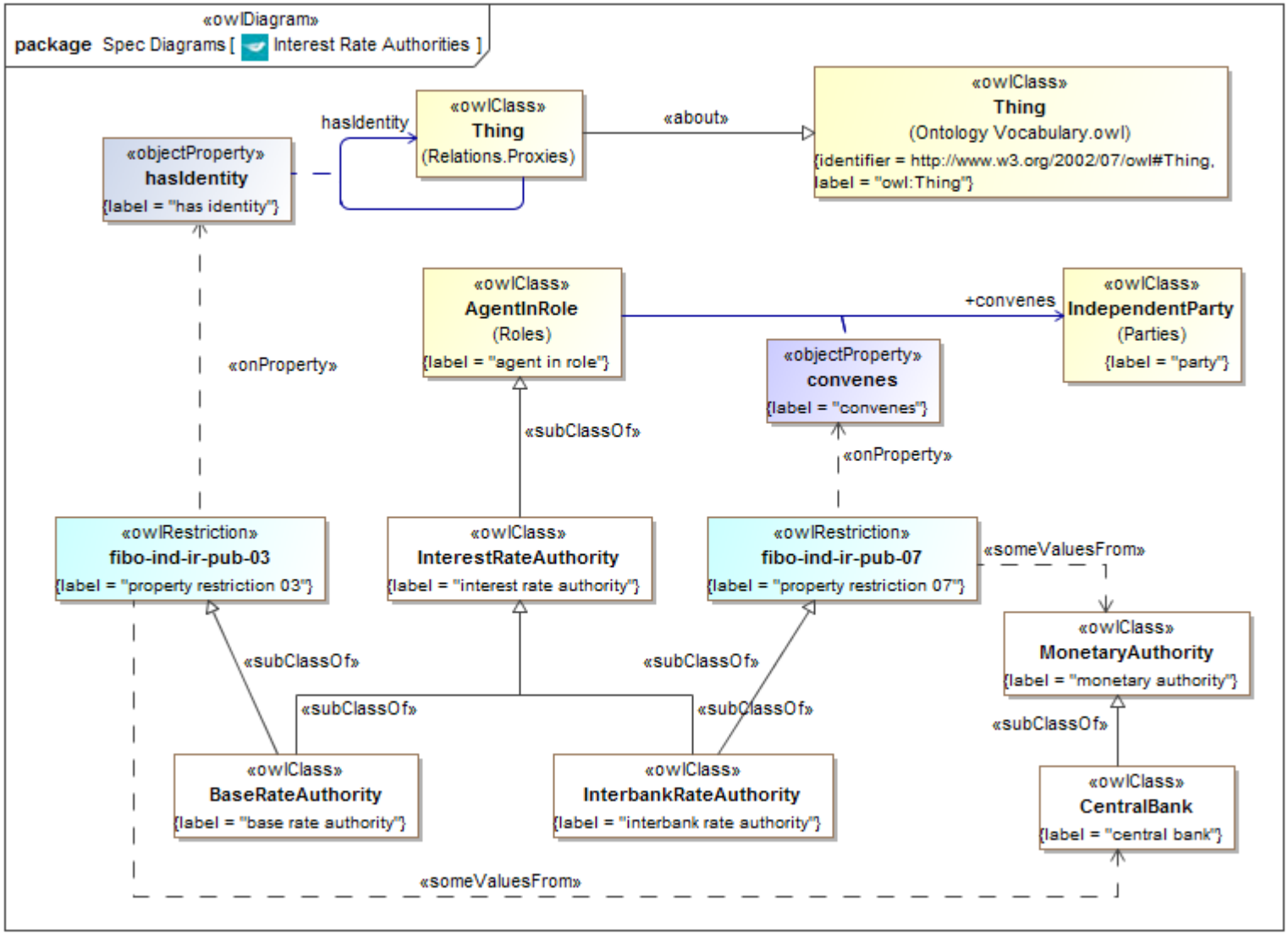

Figure 9.8 Interest Rate Publishers Concepts

Diagram showing the main types of Interest Rate Publishers.

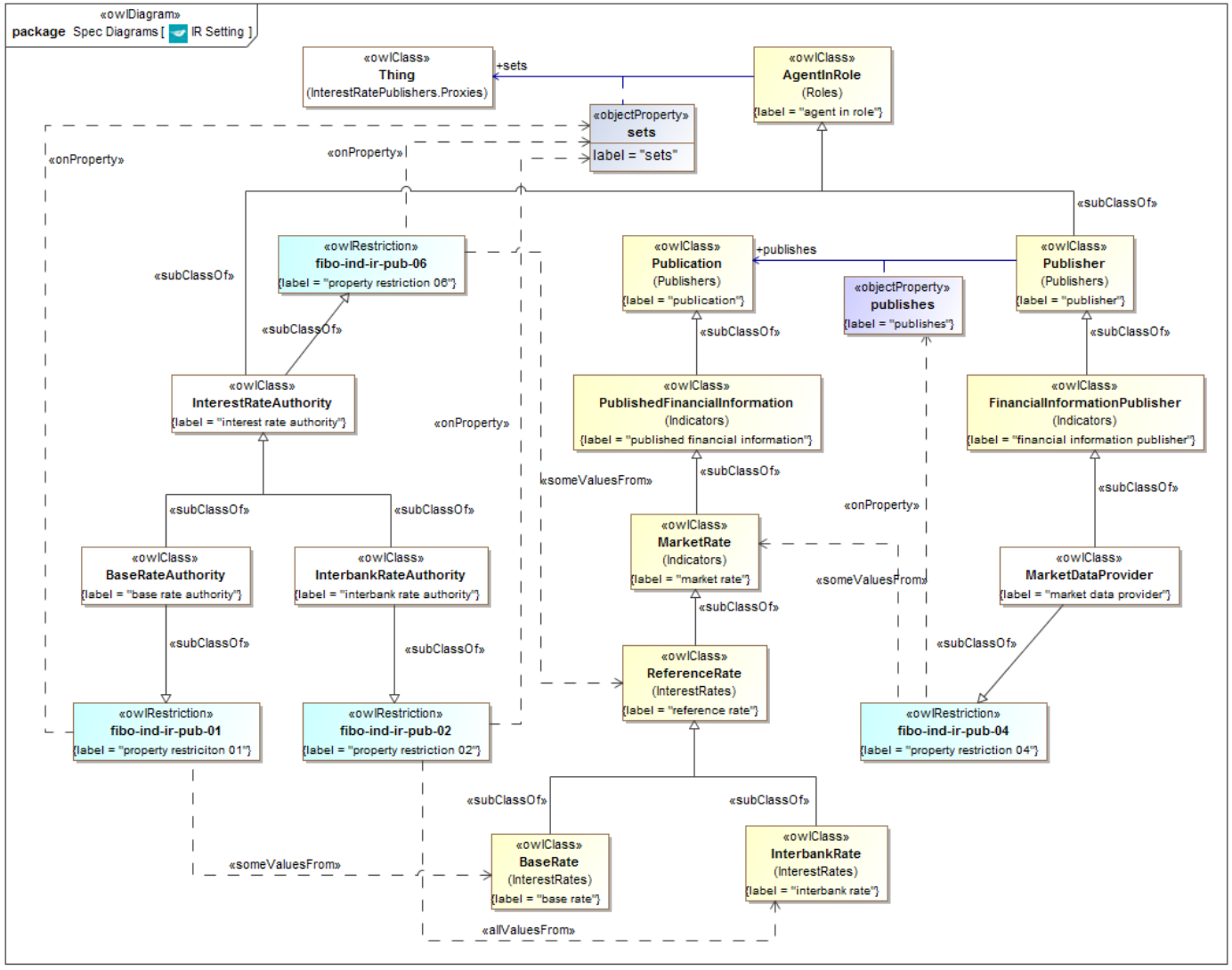

Figure 9.9 Interest Rate Setting and Publishing Concepts

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

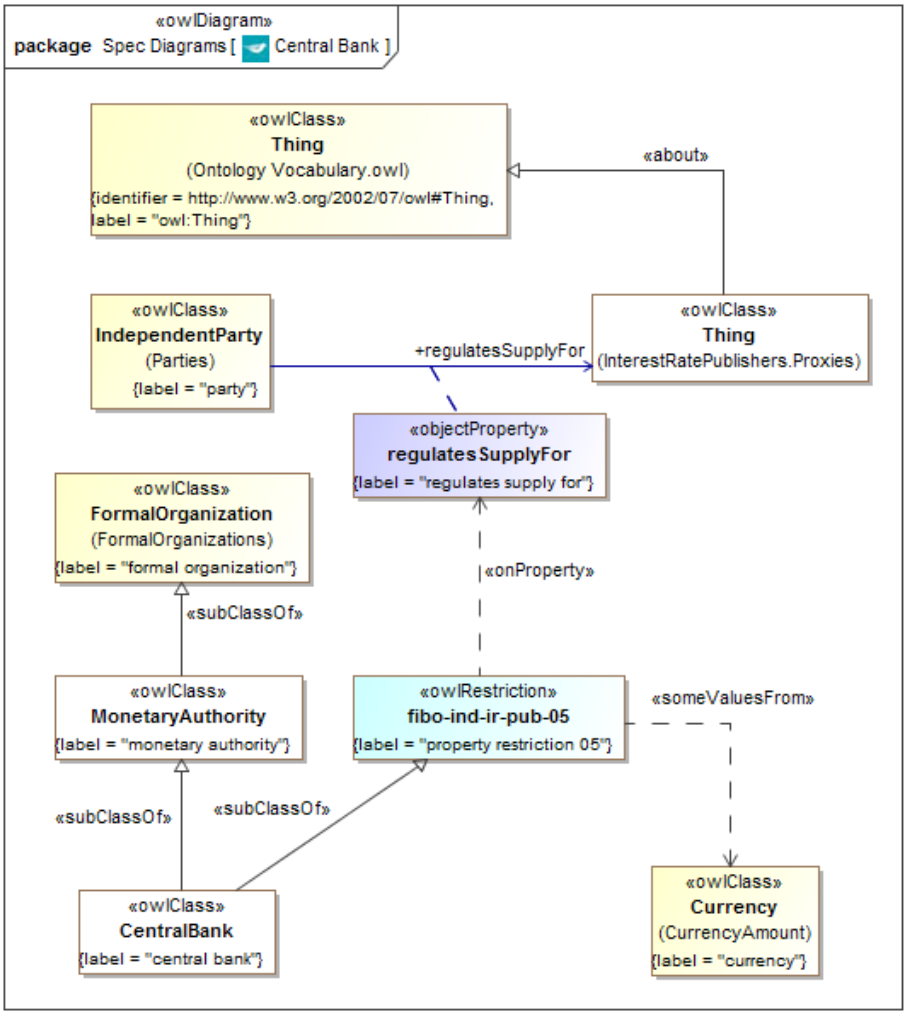

Figure 9.10 Interest Rate Publishers Central Bank Concepts

Diagram showing the concept of a central bank.

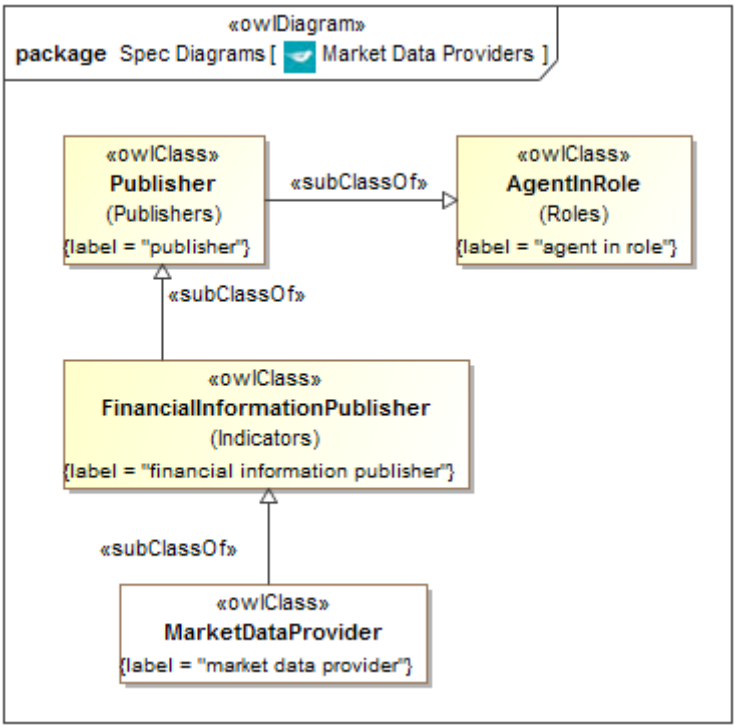

Figure 9.11 Interest Rate Publishers Market Data Provider
Diagram showing the concept of a market data provider.

Table 9.11 Interest Rate Publishers Details

Classes

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

Name	Label	definition	parent	explanatoryNote
MonetaryAuthority	monetary authority	a formal organization that controls the monetary policy, regulation and supply of money in some country or group of countries	formal organization	

Properties

Name	Label	Domain	Range	Definition	Parent
convenes	convenes	agent in role	party	a predicate indicating that someone acting in the role of convenor brings together some number of individuals for a meeting or conference; assembles; makes arrangements for a meeting to take place	
regulatesSupplyFor	regulates supply for	party	Thing	a predicate indicating that someone controls or supervises the amount of something available in some market by means of rules and regulations	governs
sets	sets	agent in role	Thing	a predicate indicating that someone places something in some relationship to something or someone else	provides

Restrictions

Name	Label	Expressions
fibo-ind-ir-pub-01	property restriction 01	sets some BaseRate
fibo-ind-ir-pub-02	property restriction 02	sets only InterbankRate

Name	Label	Expressions
fibo-ind-ir-pub-03	property restriction 03	haIdentity some CentralBank
fibo-ind-ir-pub-04	property restriction 04	publishes some MarketRate
fibo-ind-ir-pub-05	property restriction 05	regulatesSupplyFor some Currency
fibo-ind-ir-pub-06	property restriction 06	sets some ReferenceRate
fibo-ind-ir-pub-07	property restriction 07	convenes some MonetaryAuthority

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/20150501/EconomicIndicators/EconomicIndicators/
sm:dependsOn	http://www.omg.org/spec/EDMC-FIBO/FND/ http://www.omg.org/spec/EDMC-FIBO/BE/

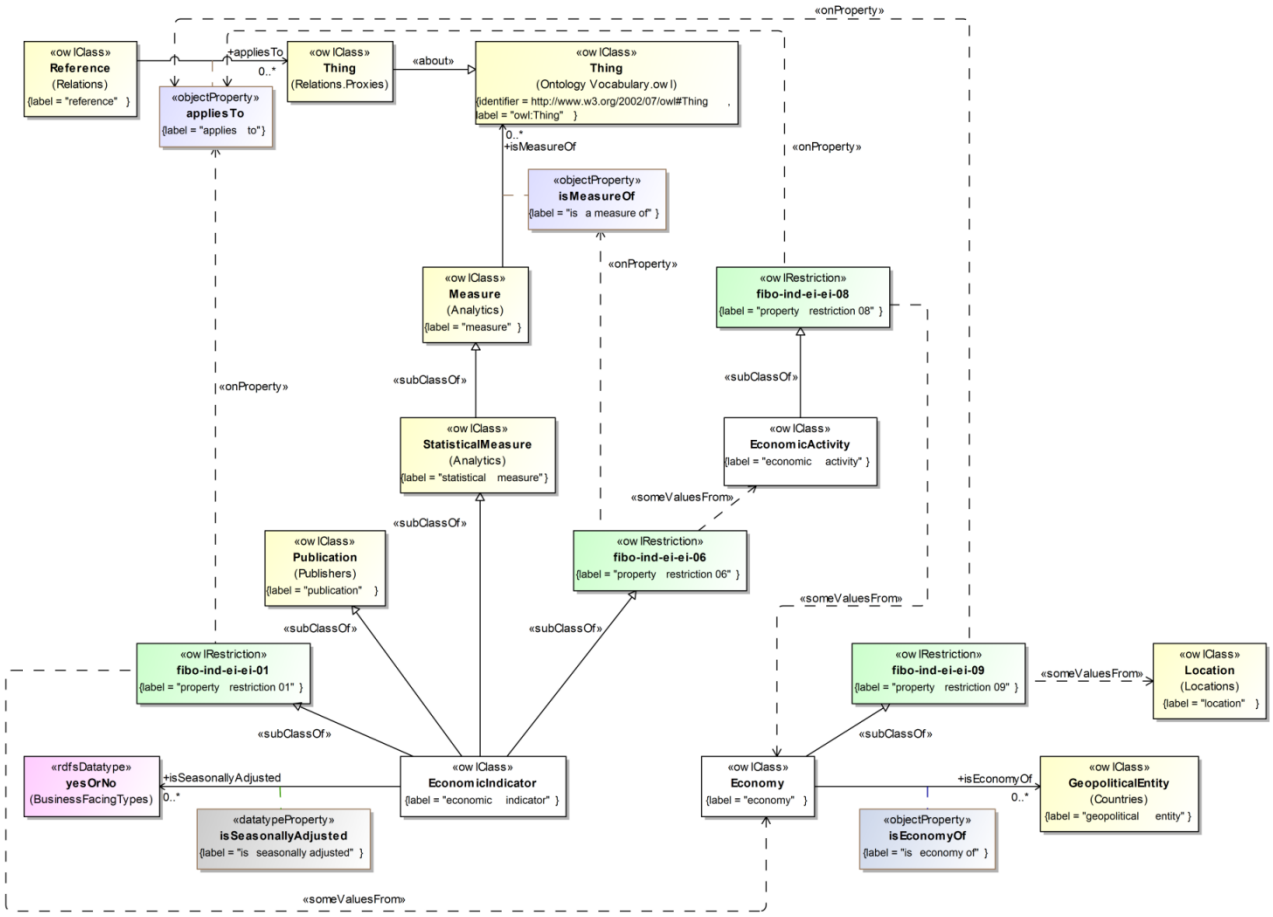

Figure 9.12 Economic Indicators Common Concepts

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

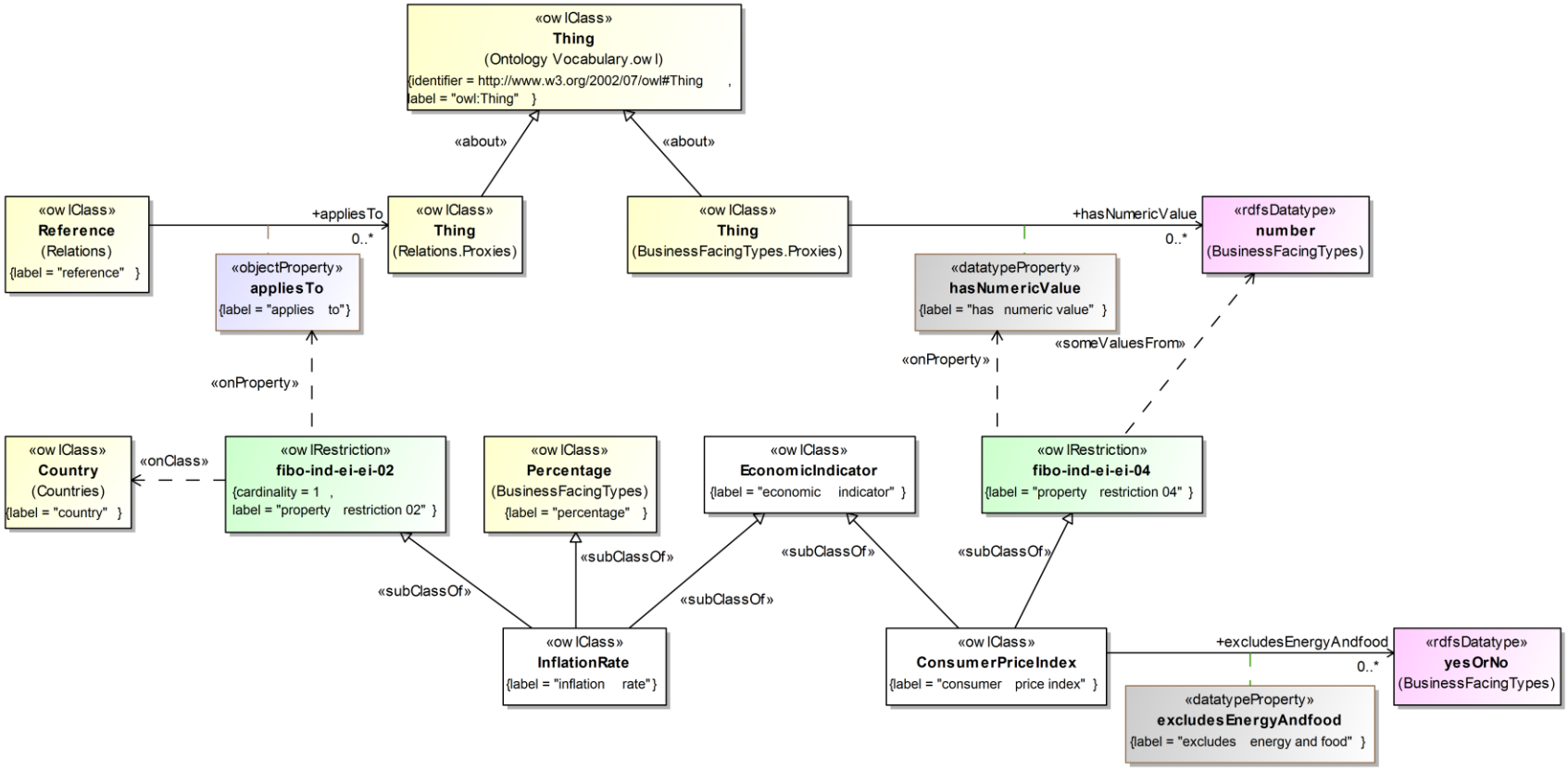

Figure 9.13 Economic Indicators Inflation Measures
Diagram showing inflation measures concepts in the Economic Indicators ontology.

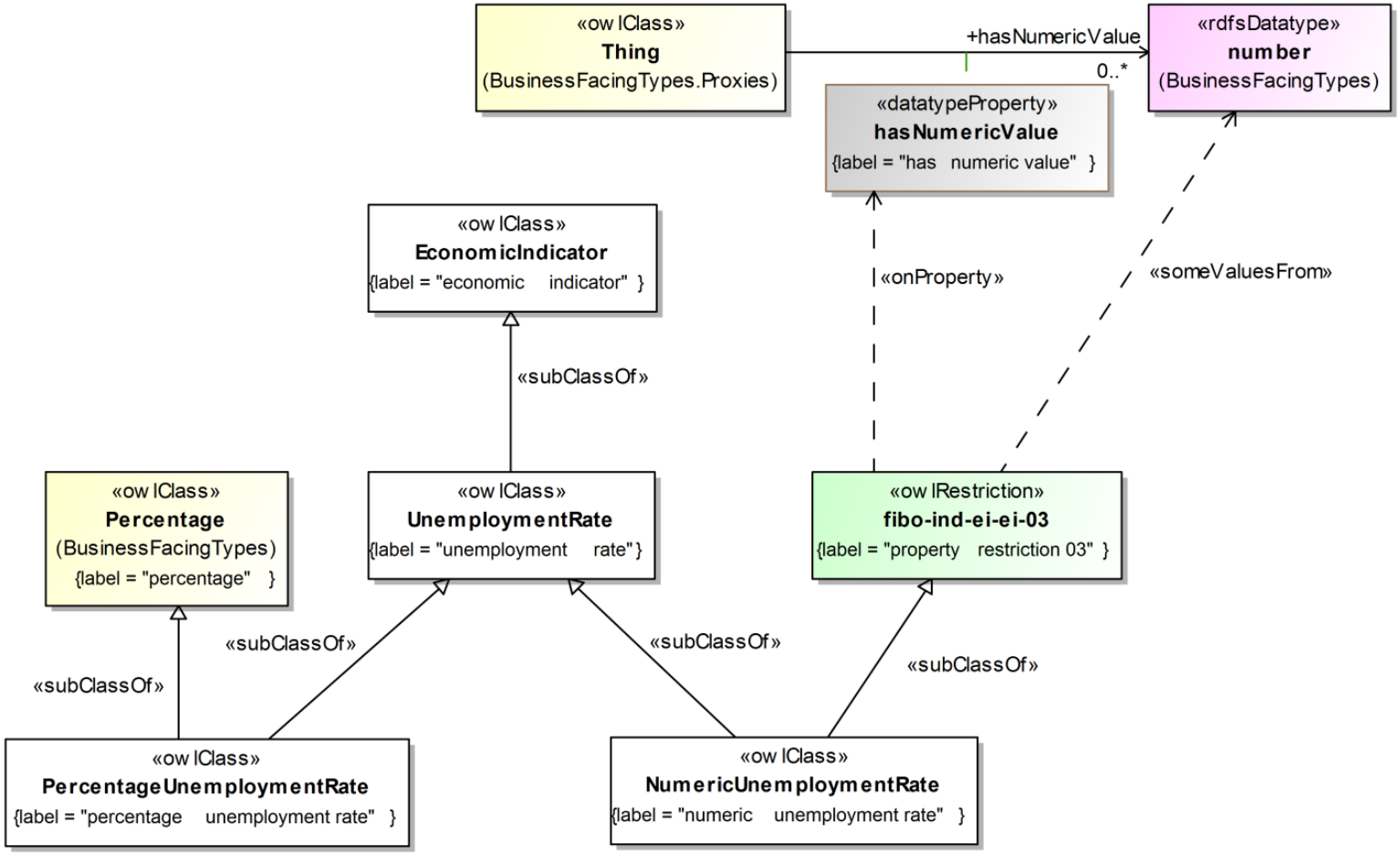

Figure 9.14 Economic Indicators Unemployment Statistics

Diagram showing unemployment index concepts in the Economic Indicators ontology.

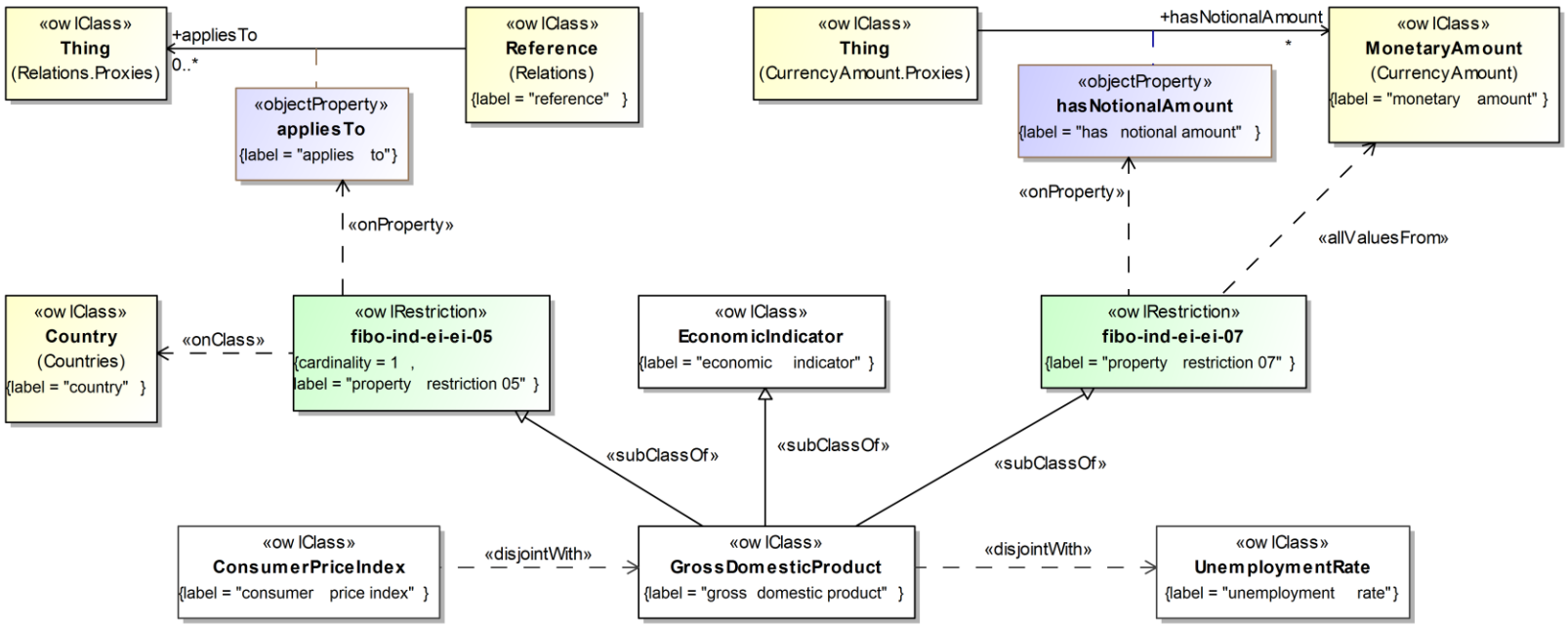

Figure 9.15 Economic Indicators Gross Domestic Product

Diagram showing GDP concepts in the Economic Indicators ontology.

Table 9.14 Economic Indicators Details

Classes

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

Name	Label	Definition	Parent	Disjoint with	Explanatory Note	Definition Source
		consumer goods and services				
EconomicActivity	economic activity	an aspect of the behavior of some economic actor in an economy, related to the production, distribution, and consumption of goods and services	property restriction 08			
EconomicIndicator	economic indicator	a statistical measure of an economic activity, used for analysis of economic performance and predictions of future performance	property restriction 01 property restriction 06 statistical measure publication			
Economy	economy, economic system	An economy consists of the production, distribution or trade, and consumption of limited goods and services by different economic actors in a given geographically distinct web of relationships.	property restriction 09			

Name	Label	Definition	Parent	Disjoint with	Explanatory Note	Definition Source
GrossDomestic Product	gross domestic product	an economic indicator representing the broadest measure of aggregate economic activity, measuring the total value of all final goods and services produced within a country's borders during a specific period	property restriction 07 economic indicator property restriction 05	unemployment rate		http://www.treasury.gov/initiatives/ofr/about/Documents/AR2013_Back_Matter_Glossary+Bib_Refs+Endnotes.pdf
InflationRate	inflation rate	an economic indicator representing a percent change in consumer prices for a specified, typically a one-year, period, for a given country	property restriction 02 economic indicator percentage			
Numeric UnemploymentRate	numeric unemployment rate	an economic indicator representing the number of unemployed in the labor force of a given economy for some specified period	property restriction 03 unemployment rate			
Percentage UnemploymentRate	percentage unemployment rate	an economic indicator representing the ratio of unemployment to the labor force of a given economy for some specified period expressed in percentage terms	unemployment rate, percentage			

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

Properties

Name	Label	Domain	Range	Definition	Explanatory Note
excludesEnergyAndfood	excludes energy and food	consumer price index	yes or no	a predicate indicating whether the index excludes energy and food prices	

Name	Label	Domain	Range	Definition	Explanatory Note
isEconomyOf	is economy of	economy	geopolitical entity	a predicate relating an economy to the geopolitical entity it refers to	
isSeasonallyAdjusted	is seasonally adjusted	economic indicator	yes or no	a predicate indicating whether some published formal method is applied that compensates for seasonal variations in the index value	Example explanation from the US Bureau of Labor and Statistics: Because price data are used for different purposes by different groups, the Bureau of Labor Statistics publishes seasonally adjusted as well as unadjusted changes each month. ... Seasonal factors used in computing the seasonally adjusted indexes are derived by the X-13ARIMA-SEATS Seasonal Adjustment Method. Seasonally adjusted indexes and seasonal factors are computed annually. Each year, the last five years of seasonally adjusted data are revised.

Restrictions

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

Name	Label	Expressions
fibo-ind-ei-ei-09	property restriction 09	appliesTo some Location

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/20150501/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/

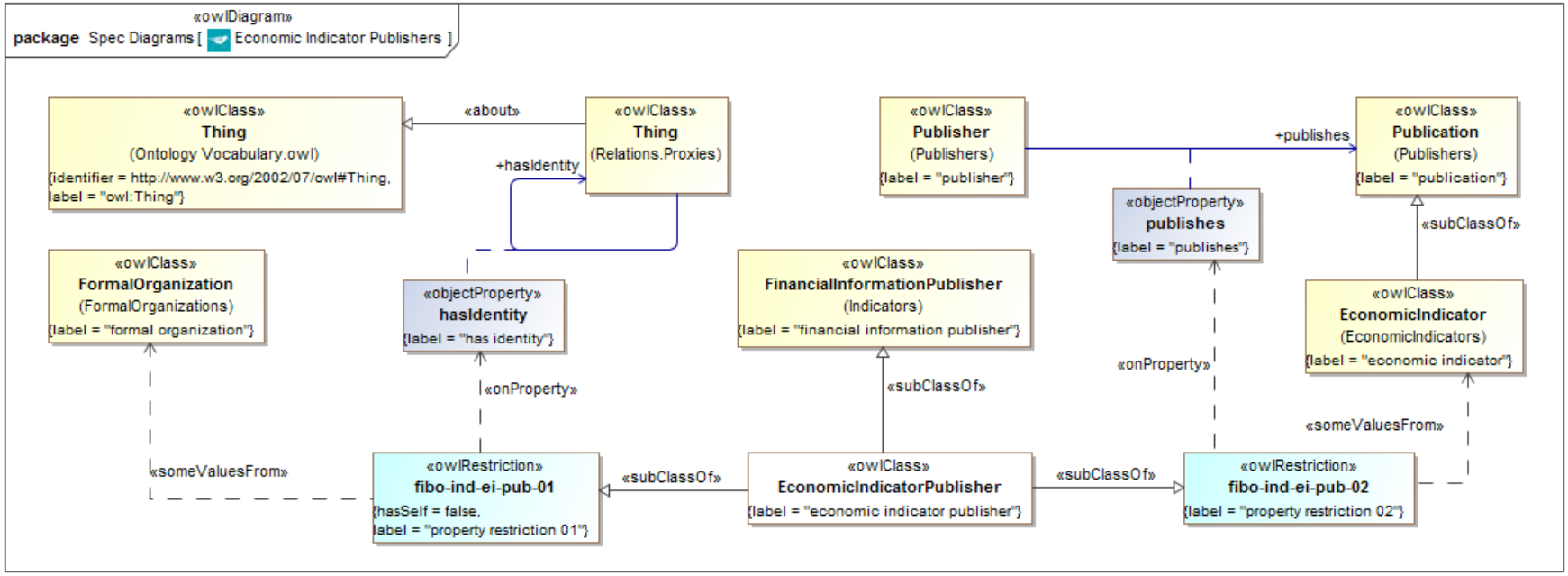

Figure 9.16 Economic Indicator Publishers Concepts

Diagram showing all of the concepts in the Economic Indicators Publishers ontology.

Table 9.16 Economic Indicator Publishers Details

Classes

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

Restrictions

Name	Label	Expressions

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

Annex A: Machine-readable files Accompanying this Specification

(normative)

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

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

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