

Package ‘bbk’

August 25, 2025

Title Client for Central Bank APIs

Version 0.7.0

Description A client for retrieving data and metadata from major central bank APIs. It supports access to the 'Bundesbank SDMX Web Service API' (<<https://www.bundesbank.de/en/statistics/time-series-databases/help-for-sdmx-web-service/web-service-interface-data>>), the 'Swiss National Bank Data Portal' (<<https://data.snb.ch/en>>), the 'European Central Bank Data Portal API' (<<https://data.ecb.europa.eu/help/api/overview>>), the 'Bank of England Interactive Statistical Database' (<<https://www.bankofengland.co.uk/boeapps/database>>), the 'Banco de España API' (<<https://www.bde.es/webbe/en/estadisticas/recursos/api-estadisticas-bde.html>>), and the 'Banque de France Web Service' (<<https://webstat.banque-france.fr/en/pages/guide-migration-api>>).

License MIT + file LICENSE

URL <https://m-muecke.github.io/bbk/>, <https://github.com/m-muecke/bbk>

BugReports <https://github.com/m-muecke/bbk/issues>

Depends R (>= 4.1.0)

Imports checkmate, curl, data.table (>= 1.17.0), httr2 (>= 1.0.0), jsonlite, stats, utils, xml2

Suggests ggplot2, scales, testthat (>= 3.0.0)

Config/testthat/edition 3

Encoding UTF-8

RoxygenNote 7.3.2

NeedsCompilation no

Author Maximilian Mücke [aut, cre] (ORCID: <<https://orcid.org/0009-0000-9432-9795>>)

Maintainer Maximilian Mücke <muecke.maximilian@gmail.com>

Repository CRAN

Date/Publication 2025-08-25 08:40:13 UTC

Contents

bbk_data	2
bbk_metadata	4
bbk_series	5
bde_data	6
bdf_codelist	7
bdf_data	8
bdf_dataset	9
boe_data	10
ecb_data	11
ecb_euro_rates	12
ecb_metadata	13
onb_data	14
onb_dimension	15
onb_frequency	16
onb_hierarchy	17
onb_metadata	18
onb_toc	19
snb_data	19

Index	21
--------------	-----------

bbk_data	<i>Fetch Deutsche Bundesbank (BBk) data</i>
----------	---

Description

Retrieve time series data from the Bundesbank SDMX Web Service.

Usage

```
bbk_data(
  flow,
  key = NULL,
  start_period = NULL,
  end_period = NULL,
  first_n = NULL,
  last_n = NULL
)
```

Arguments

flow	(character(1)) The flow to query, 5-8 characters. See bbk_metadata() for available dataflows.
key	(character()) The series keys to query.

start_period	(NULL character(1) integer(1)) The start date of the data. Supported formats: • YYYY for annual data (e.g., "2019") • YYYY-S[1-2] for semi-annual data (e.g., "2019-S1") • YYYY-Q[1-4] for quarterly data (e.g., "2019-Q1") • YYYY-MM for monthly data (e.g., "2019-01") • YYYY-W[01-53] for weekly data (e.g., "2019-W01") • YYYY-MM-DD for daily and business data (e.g., "2019-01-01") If NULL, no start date restriction is applied (data retrieved from the earliest available date). Default NULL.
end_period	(NULL character(1) integer(1)) The end date of the data, in the same format as start_period. If NULL, no end date restriction is applied (data retrieved up to the most recent available date). Default NULL.
first_n	(NULL numeric(1)) Number of observations to retrieve from the start of the series. If NULL, no restriction is applied. Default NULL.
last_n	(NULL numeric(1)) Number of observations to retrieve from the end of the series. If NULL, no restriction is applied. Default NULL.

Value

A `data.table::data.table()` with the requested data.

Source

<https://www.bundesbank.de/en/statistics/time-series-databases/help-for-sdmx-web-service/web-service-interface-data>

See Also

Other data: `bbk_series()`, `bde_data()`, `bdf_codelist()`, `bdf_data()`, `bdf_dataset()`, `boe_data()`, `ecb_data()`, `onb_data()`, `snb_data()`

Examples

```
# fetch all data for a given flow and key
bbk_data("BBSIS", "D.I.ZAR.ZI.EUR.S1311.B.A604.R10XX.R.A.A._Z._Z.A")
# fetch data for multiple keys
bbk_data("BBEX3", c("M.ISK.EUR", "USD.CA.AC.A01"))
# specified period (start date-end date) for daily data
bbk_data(
  "BBSIS", "D.I.ZAR.ZI.EUR.S1311.B.A604.R10XX.R.A.A._Z._Z.A",
  start_period = "2020-01-01",
  end_period = "2020-08-01"
)
```

```
# or only specify the start date
bbk_data(
  "BBSIS", "D.I.ZAR.ZI.EUR.S1311.B.A604.R10XX.R.A.A._Z._Z.A",
  start_period = "2024-04-01"
)
```

bbk_metadata	<i>Fetch Deutsche Bundesbank (BBk) metadata</i>
--------------	---

Description

Retrieve metadata from the Bundesbank time series database via the SDMX Web Service.

Usage

```
bbk_metadata(type, id = NULL, lang = "en")
```

Arguments

type	(character(1)) The type of metadata to query. One of: "datastructure", "dataflow", "codelist", or "concept".
id	(NULL character(1)) The id to query. Default NULL.
lang	(character(1)) Language to query, either "en" or "de". Default "en".

Value

A `data.table::data.table()` with the requested metadata. The columns are:

id	The id of the metadata
name	The name of the metadata

Source

<https://www.bundesbank.de/en/statistics/time-series-databases/help-for-sdmx-web-service/web-service-interface-metadata>

See Also

Other metadata: `ecb_metadata()`, `onb_dimension()`, `onb_frequency()`, `onb_hierarchy()`, `onb_metadata()`, `onb_toc()`

Examples

```
bbk_metadata("datastructure")
bbk_metadata("dataflow", "BBSIS")
bbk_metadata("codelist", "CL_BBK_ACIP_ASSET_LIABILITY")
bbk_metadata("concept", "CS_BBK_BSPL")
```

bbk_series

Fetch the Deutsche Bundesbank (BBk) series

Description

Retrieve a single series by its key via the Bundesbank SDMX Web Service.

Usage

```
bbk_series(key)
```

Arguments

key (character())
The series keys to query.

Value

A `data.table::data.table()` with the requested data.

Source

<https://www.bundesbank.de/en/statistics/time-series-databases/help-for-sdmx-web-service/web-service-interface-data>

See Also

`bbk_data()` for an endpoint with more options.

Other data: `bbk_data()`, `bde_data()`, `bdf_codelist()`, `bdf_data()`, `bdf_dataset()`, `boe_data()`, `ecb_data()`, `onb_data()`, `snb_data()`

Examples

```
bbk_series("BBEX3.M.DKK.EUR.BB.AC.A01")
bbk_series("BBAF3.Q.F41.S121.DE.S1.W0.LE.N._X.B")
bbk_series("BBBK11.D.TTA000")
```

bde_data	<i>Fetch Banco de España (BdE) data</i>
----------	---

Description

Retrieve time series data from the BdE statistics API.

Usage

```
bde_data(key, time_range = NULL, lang = "en")
```

Arguments

key	(character()) The series keys to query.
time_range	(NULL character(1) integer(1)) The time range for the data. Can be an annual range (e.g., 2024) or a frequency-based code: • Daily frequency (D): "3M" (last 3 months), "12M", "36M" • Monthly frequency (M): "30M", "60M", "MAX" (entire series) • Quarterly frequency (Q): "30M", "60M", "MAX" • Annual frequency (A): "60M", "MAX" If NULL (default), returns the smallest range for the series frequency (e.g., "30M" for monthly series).
lang	(character(1)) Language to query, either "en" or "es".

Details

You can search for the series codes in the **BIEST** application or in the tables published by the Banco de España.

Value

A `data.table::data.table()` with the requested data.

Source

<https://www.bde.es/webbe/en/estadisticas/recursos/api-estadisticas-bde.html>

See Also

Other data: `bbk_data()`, `bbk_series()`, `bdf_codelist()`, `bdf_data()`, `bdf_dataset()`, `boe_data()`, `ecb_data()`, `onb_data()`, `snb_data()`

Examples

```
bde_data("D_1NBAF472", time_range = "30M")
bde_data(c("DTNPDE2010_P0000P_PS_APU", "DTNSEC2010_S0000P_APU_SUMAMOVIL"), time_range = "MAX")
bde_data("DEEQ.N.ES.W1.S1.S1.T.B.G._Z._Z._Z.EUR._T._X.N.ALL", time_range = 2024)
```

bdf_codelist	<i>Fetch Banque de France (BdF) codelists</i>
--------------	---

Description

Fetch Banque de France (BdF) codelists

Usage

```
bdf_codelist(...)
```

Arguments

... (any)
Extra arguments appended to the API request. Combined with the default arguments with `modifyList()`.

Value

A `data.table::data.table()` with the requested data.

Source

<https://webstat.banque-france.fr/en/pages/guide-migration-api/>

See Also

Other data: `bbk_data()`, `bbk_series()`, `bde_data()`, `bdf_data()`, `bdf_dataset()`, `boe_data()`, `ecb_data()`, `onb_data()`, `snb_data()`

Examples

```
## Not run:
bdf_codelist()
# filter for a specific codelist
bdf_codelist(where = "codelist_id = 'CL_FREQ'")

## End(Not run)
```

bdf_data

*Fetch Banque de France (BdF) data***Description**

Retrieve time series data from the BdF Webstat API.

Usage

```
bdf_data(
  ...,
  key = NULL,
  start_date = NULL,
  end_date = NULL,
  api_key = bdf_key()
)
```

Arguments

...	(any) Extra arguments appended to the API request. Combined with the default arguments with <code>modifyList()</code> .
key	(NULL character(1)) The series key to query. Default NULL.
start_date	(NULL character(1) Date(1)) Start date of the data. Default NULL.
end_date	(NULL character(1) Date(1)) End date of the data. Default NULL.
api_key	(character(1)) API key to use for the request. Defaults to the value returned by <code>bdf_key()</code> , which reads from the <code>BANQUEDEFrance_KEY</code> environment variable.

Value

A `data.table::data.table()` with the requested data.

Source

<https://webstat.banque-france.fr/en/pages/guide-migration-api/>

See Also

Other data: `bbk_data()`, `bbk_series()`, `bde_data()`, `bdf_codelist()`, `bdf_dataset()`, `boe_data()`, `ecb_data()`, `onb_data()`, `snb_data()`

Examples

```
## Not run:
bdf_data(key = "CONJ2.M.R24.T.SM.0RG24.EFTPM100.10")
# inflation rate
bdf_data(key = "ICP.M.FR.N.000000.4.ANR")
# or with a date filter
bdf_data(key = "ICP.M.FR.N.000000.4.ANR", start_date = "2025-01-01", end_date = "2025-06-30")
# advanced filter with where clause
bdf_data(key = "ICP.M.FR.N.000000.4.ANR", where = "time_period_start >= date'2025-01-01'")

## End(Not run)
```

bdf_dataset	<i>Fetch Banque de France (BdF) datasets</i>
-------------	--

Description

Fetch Banque de France (BdF) datasets

Usage

```
bdf_dataset(...)
```

Arguments

... (any)
Extra arguments appended to the API request. Combined with the default arguments with `modifyList()`.

Value

A `data.table::data.table()` with the requested data.

Source

<https://webstat.banque-france.fr/en/pages/guide-migration-api/>

See Also

Other data: `bbk_data()`, `bbk_series()`, `bde_data()`, `bdf_codelist()`, `bdf_data()`, `boe_data()`, `ecb_data()`, `onb_data()`, `snb_data()`

Examples

```
## Not run:
bdf_dataset()
# structure of a dataset
bdf_dataset(where = "dataset_id = 'CONJ2'")

## End(Not run)
```

boe_data	<i>Fetch Bank of England (BoE) data</i>
----------	---

Description

Retrieve time series data from the BoE database.

Usage

```
boe_data(key, start_date, end_date = Sys.Date())
```

Arguments

key	(character()) The series keys to query.
start_date	(character(1) Date(1)) Start date of the data.
end_date	(character(1) Date(1)) End date of the data. Default is today's date.

Value

A `data.table::data.table()` with the requested data.

Source

<https://www.bankofengland.co.uk/boeapps/database>

See Also

Other data: `bbk_data()`, `bbk_series()`, `bde_data()`, `bdf_codelist()`, `bdf_data()`, `bdf_dataset()`, `ecb_data()`, `onb_data()`, `snb_data()`

Examples

```
boe_data(c("IUMABEDR", "IUALBEDR"), "2015-01-01")
```

ecb_data

*Fetch European Central Bank (ECB) data***Description**

Retrieve time series data from the ECB SDMX Web Service.

Usage

```
ecb_data(
  flow,
  key = NULL,
  start_period = NULL,
  end_period = NULL,
  first_n = NULL,
  last_n = NULL
)
```

Arguments

flow	(character(1)) Flow to query.
key	(character()) The series keys to query.
start_period	(NULL character(1) integer(1)) Start date of the data. Supported formats: • YYYY for annual data (e.g., 2019) • YYYY-S[1-2] for semi-annual data (e.g., "2019-S1") • YYYY-Q[1-4] for quarterly data (e.g., "2019-Q1") • YYYY-MM for monthly data (e.g., "2019-01") • YYYY-W[01-53] for weekly data (e.g., "2019-W01") • YYYY-MM-DD for daily and business data (e.g., "2019-01-01") If NULL, no start date restriction is applied (data retrieved from the earliest available date). Default NULL.
end_period	(NULL character(1) integer(1)) End date of the data, in the same format as start_period. If NULL, no end date restriction is applied (data retrieved up to the most recent available date). Default NULL.
first_n	(NULL numeric(1)) Number of observations to retrieve from the start of the series. If NULL, no restriction is applied. Default NULL.
last_n	(NULL numeric(1)) Number of observations to retrieve from the end of the series. If NULL, no restriction is applied. Default NULL.

Value

A `data.table::data.table()` with the requested data.

Source

<https://data.ecb.europa.eu/help/api/data>

See Also

Other data: `bbk_data()`, `bbk_series()`, `bde_data()`, `bdf_codelist()`, `bdf_data()`, `bdf_dataset()`, `boe_data()`, `onb_data()`, `snb_data()`

Examples

```
# fetch US dollar/Euro exchange rate
ecb_data("EXR", "D.USD.EUR.SP00.A")
# fetch data for multiple keys
ecb_data("EXR", c("D.USD", "JPY.EUR.SP00.A"))
```

ecb_euro_rates

Fetch Euro foreign exchange reference rates

Description

Fetch the latest or historical Euro foreign exchange reference rates from the European Central Bank (ECB).

Usage

```
ecb_euro_rates(x = "latest")
```

Arguments

x (character(1))
One of "latest" or "history". Default "latest".

Details

Note you can achieve the same by calling the `ecb_data()` function with the right parameters for each currency.

The reference rates are usually updated at around 16:00 CET every working day, except on **TARGET closing days**.

They are based on the daily concertation procedure between central banks across Europe, which normally takes place around 14:10 CET. The reference rates are published for information purposes only. Using the rates for transaction purposes is strongly discouraged.

Value

A `data.table::data.table()` with the reference rates.

Source

https://www.ecb.europa.eu/stats/policy_and_exchange_rates/euro_reference_exchange_rates/html/index.en.html

Examples

```
ecb_euro_rates()
```

ecb_metadata	<i>Fetch European Central Bank (ECB) metadata</i>
--------------	---

Description

Retrieve metadata from the ECB time series database via the SDMX Web Service.

Usage

```
ecb_metadata(type, agency = NULL, id = NULL)
```

Arguments

type	(character(1)) The type of metadata to query. One of: "datastructure", "dataflow", "codelist", or "concept".
agency	(NULL character(1)) The id of the agency to query. Default NULL.
id	(NULL character(1)) The id of the resource to query. Default NULL.

Value

A `data.table::data.table()` with the requested metadata. The columns are:

agency	The agency of the metadata
id	The id of the metadata
name	The name of the metadata

Source

<https://data.ecb.europa.eu/help/api/metadata>

See Also

Other metadata: `bbk_metadata()`, `onb_dimension()`, `onb_frequency()`, `onb_hierarchy()`, `onb_metadata()`, `onb_toc()`

Examples

```
ecb_metadata("datastructure")
ecb_metadata("datastructure", "ECB")
ecb_metadata("datastructure", "ECB", "ECB_EXR1")
ecb_metadata("datastructure", id = "ECB_EXR1")
```

onb_data

Fetch Österreichische Nationalbank (OeNB) data

Description

Retrieve time series data from the OeNB Web Service.

Usage

```
onb_data(
  hier_id,
  key,
  ...,
  start_period = NULL,
  end_period = NULL,
  freq = NULL,
  lang = "en"
)
```

Arguments

<code>hier_id</code>	(integer(1)) Hierarchy id to query.
<code>key</code>	(character()) The series keys to query.
<code>...</code>	(any) Additional parameters to pass to the API.
<code>start_period</code>	(NULL character(1) integer(1)) Start date of the data.
<code>end_period</code>	(NULL character(1) integer(1)) End date of the data.

freq	(NULL character(1)) Frequency of the data.
lang	(character(1)) Language to query. Default "en".

Value

A `data.table::data.table()` with the requested data.

Source

<https://www.oenb.at/en/Statistics/User-Defined-Tables/webservice.html>

See Also

Other data: `bbk_data()`, `bbk_series()`, `bde_data()`, `bdf_codelist()`, `bdf_data()`, `bdf_dataset()`, `boe_data()`, `ecb_data()`, `snb_data()`

Examples

```
onb_data(hier_id = 11, key = "VDBFKBSC217000")
# Loans to euro area residents, since 2000:
onb_data(hier_id = 11, key = "VDBFKBSC217000", start_period = "2000-01-01")
# Austrian imports and exports of goods from/to Germany, 2002-2012, annual frequency:
onb_data(hier_id = 901, key = "VDBQZA1000", start_period = 2002, end_period = 2012, freq = "A")
# Number of Austrian banks' subsidiaries abroad an in the EU, from 2005, semiannual:
onb_data(
  hier_id = 321,
  key = c("VDBKISDANZTAU", "VDBKISDANZTEU"),
  start_period = 200501,
  freq = "H"
)
```

onb_dimension

Fetch Österreichische Nationalbank (OeNB) dimension

Description

Fetch Österreichische Nationalbank (OeNB) dimension

Usage

```
onb_dimension(hier_id, key, lang = "en")
```

Arguments

hier_id	(integer(1)) Hierarchy id to query.
key	(character()) The series keys to query.
lang	(character(1)) Language to query. Default "en".

Value

A `data.table::data.table()` with the requested data.

See Also

Other metadata: `bbk_metadata()`, `ecb_metadata()`, `onb_frequency()`, `onb_hierarchy()`, `onb_metadata()`, `onb_toc()`

Examples

```
onb_dimension(hier_id = 11, key = "VDBFKBSC217000")
```

onb_frequency	<i>Fetch Österreichische Nationalbank (OeNB) data frequency</i>
---------------	---

Description

Fetch Österreichische Nationalbank (OeNB) data frequency

Usage

```
onb_frequency(hier_id, key, lang = "en", ...)
```

Arguments

hier_id	(integer(1)) Hierarchy id to query.
key	(character()) The series keys to query.
lang	(character(1)) Language to query. Default "en".
...	(any) Additional parameters to pass to the API.

Value

A `data.table::data.table()` with the requested data.

See Also

Other metadata: [bbk_metadata\(\)](#), [ecb_metadata\(\)](#), [onb_dimension\(\)](#), [onb_hierarchy\(\)](#), [onb_metadata\(\)](#), [onb_toc\(\)](#)

Examples

```
onb_frequency(hier_id = 74, key = "VDBOSBHAGBSTIN")
onb_frequency(hier_id = 11, key = "VDBFKBSC217000")
```

onb_hierarchy	<i>Fetch Österreichische Nationalbank (OeNB) hierarchy</i>
---------------	--

Description

Fetch Österreichische Nationalbank (OeNB) hierarchy

Usage

```
onb_hierarchy(hier_id, lang = "en")
```

Arguments

hier_id	(integer(1)) Hierarchy id to query.
lang	(character(1)) Language to query. Default "en".

Value

A [data.table::data.table\(\)](#) with the requested data.

See Also

Other metadata: [bbk_metadata\(\)](#), [ecb_metadata\(\)](#), [onb_dimension\(\)](#), [onb_frequency\(\)](#), [onb_metadata\(\)](#), [onb_toc\(\)](#)

Examples

```
onb_hierarchy(hier_id = 11)
```

onb_metadata	<i>Fetch Österreichische Nationalbank (OeNB) metadata</i>
--------------	---

Description

Fetch Österreichische Nationalbank (OeNB) metadata

Usage

```
onb_metadata(hier_id, key, ..., lang = "en")
```

Arguments

hier_id	(integer(1)) Hierarchy id to query.
key	(character()) The series keys to query.
...	(any) Additional parameters to pass to the API.
lang	(character(1)) Language to query. Default "en".

Value

A `data.table::data.table()` with the requested data.

See Also

Other metadata: [bbk_metadata\(\)](#), [ecb_metadata\(\)](#), [onb_dimension\(\)](#), [onb_frequency\(\)](#), [onb_hierarchy\(\)](#), [onb_toc\(\)](#)

Examples

```
onb_metadata(hier_id = 11, key = "VDBFKBSC217000")
```

onb_toc	<i>Fetch Österreichische Nationalbank (OeNB) table of contents</i>
---------	--

Description

Fetch Österreichische Nationalbank (OeNB) table of contents

Usage

```
onb_toc(lang = "en")
```

Arguments

lang	(character(1)) Language to query. Default "en".
------	--

Value

A `data.table::data.table()` with the requested data.

See Also

Other metadata: [bbk_metadata\(\)](#), [ecb_metadata\(\)](#), [onb_dimension\(\)](#), [onb_frequency\(\)](#), [onb_hierarchy\(\)](#), [onb_metadata\(\)](#)

Examples

```
onb_toc()
```

snb_data	<i>Fetch Swiss National Bank (SNB) data</i>
----------	---

Description

Retrieve time series data from the SNB data portal.

Usage

```
snb_data(key, start_date = NULL, end_date = NULL, lang = "en")
```

Arguments

key	(character(1)) The series key to query.
start_date	(NULL character(1) Date(1)) Start date of the data.
end_date	(NULL character(1) Date(1)) End date of the data.
lang	(character(1)) Language to query, either "en" or "de". Default "en".

Value

A `data.table::data.table()` with the requested data.

Source

<https://data.snb.ch/en>

See Also

Other data: `bbk_data()`, `bbk_series()`, `bde_data()`, `bdf_codelist()`, `bdf_data()`, `bdf_dataset()`, `boe_data()`, `ecb_data()`, `onb_data()`

Examples

```
snb_data("rendopar")  
# or filter for date range  
snb_data("rendopar", "2020-01-01", "2020-12-31")
```

Index

* data

- bbk_data, [2](#)
- bbk_series, [5](#)
- bde_data, [6](#)
- bdf_codelist, [7](#)
- bdf_data, [8](#)
- bdf_dataset, [9](#)
- boe_data, [10](#)
- ecb_data, [11](#)
- onb_data, [14](#)
- snb_data, [19](#)

* metadata

- bbk_metadata, [4](#)
- ecb_metadata, [13](#)
- onb_dimension, [15](#)
- onb_frequency, [16](#)
- onb_hierarchy, [17](#)
- onb_metadata, [18](#)
- onb_toc, [19](#)

bbk_data, [2](#), [5–10](#), [12](#), [15](#), [20](#)
bbk_data(), [5](#)
bbk_metadata, [4](#), [14](#), [16–19](#)
bbk_metadata(), [2](#)
bbk_series, [3](#), [5](#), [6–10](#), [12](#), [15](#), [20](#)
bde_data, [3](#), [5](#), [6](#), [7–10](#), [12](#), [15](#), [20](#)
bdf_codelist, [3](#), [5](#), [6](#), [7](#), [8–10](#), [12](#), [15](#), [20](#)
bdf_data, [3](#), [5–7](#), [8](#), [9](#), [10](#), [12](#), [15](#), [20](#)
bdf_dataset, [3](#), [5–8](#), [9](#), [10](#), [12](#), [15](#), [20](#)
boe_data, [3](#), [5–9](#), [10](#), [12](#), [15](#), [20](#)

data.table::data.table(), [3–10](#), [12](#), [13](#),
[15–20](#)

ecb_data, [3](#), [5–10](#), [11](#), [15](#), [20](#)
ecb_data(), [12](#)
ecb_euro_rates, [12](#)
ecb_metadata, [4](#), [13](#), [16–19](#)

modifyList(), [7–9](#)

onb_data, [3](#), [5–10](#), [12](#), [14](#), [20](#)

onb_dimension, [4](#), [14](#), [15](#), [17–19](#)

onb_frequency, [4](#), [14](#), [16](#), [16](#), [17–19](#)

onb_hierarchy, [4](#), [14](#), [16](#), [17](#), [17](#), [18](#), [19](#)

onb_metadata, [4](#), [14](#), [16](#), [17](#), [18](#), [19](#)

onb_toc, [4](#), [14](#), [16–18](#), [19](#)

snb_data, [3](#), [5–10](#), [12](#), [15](#), [19](#)