

MUNI Loss Forecast API User Guide

version 1.7.9

Authentication Instructions

When given access to use the **MUNI Loss Forecast API** (<https://api.economy.com/muni/v1/>), you will receive an *access key* and an *encryption key*. Both authentication method require the keys.

Getting API Keys

Access to the API is controlled by the combination of an access key and an encryption key. These keys are issued to a single user. To obtain your keys, go to the "My Subscriptions" section of your Economy.com account:

<https://www.economy.com/myeconomy/api-key-info>.

Example access key and encryption key

```
DB73FDF0-043C-4018-A7EB-CFB57356BA22  
7C7C2FEA-6D18-49A1-BEC9-193B67EAE87D
```

HMAC signature is created by using the encryption key to create a SHA256 hash of the concatenation of access key and *timestamp*. The timestamp must be formatted as *yyyy-MM-ddTHH:mm:ssZ* with the time converted to the Universal Coordinated Time (UTC). For example, *July 30th, 2012 5:03:28pm EST* would be represented as *2012-07-30T21:03:28Z*.

Note: The timestamp must be current and be retrieved just prior to the creation of the signature. If the timestamp is not within a 5 minute window of the current time, access will be denied and the service will return a 401 error.

The authentication process requires the access key, timestamp, and the computed signature to be passed in the header of the request. Here is an example of what the header should look like when using an access key of *DB73FDF0-043C-4018-A7EB-CFB57356BA22*, an encryption key of *7C7C2FEA-6D18-49A1-BEC9-193B67EAE87D* and a timestamp of *2012-08-02T14:25:20Z*.

```
AccessKeyId: DB73FDF0-043C-4018-A7EB-CFB57356BA22  
Signature: A7808C5A67C422054364F195B16175308317930848232C6A08A77224F1017E83  
Timestamp: 2012-08-02T14:25:20Z
```

For samples on how to create a signature,, [click here](#) (note: the linked samples are for our Data Buffet API; however, the methods for creating HMAC signature are still applicable for MUNI Loss Forecast API)

oAuth Token can be generated by calling an API endpoint, using API access key as *client_id* and API encryption key as *client_secret* and it will remain valid for 1 hour.

The *oauth2/token* endpoint is used to generate oAuth Token using your *access key as client_id*, *encryption key as client_secret* and *grant_type as client_credentials*. Following cURL request can be used to obtain an OAuth token.

```
curl -X POST \  
https://api.economy.com/muni/v1/oauth2/token \  

```

```
-H 'Content-Type: application/x-www-form-urlencoded' \
-d 'client_id=DB73FDF0-043C-4018-A7EB-CFB57356BA22' \
-d 'client_secret=47C7C2FEA-6D18-49A1-BEC9-193B67EAE87D' \
-d 'grant_type=client_credentials'
```

The response to the above request will have a new access token.

```
{
  "token_type": "bearer",
  "access_token": "SrZ5UkbzPn432zqMLgV3Ja",
  "expires_in": 3600
}
```

Making an API Call

The current version of the MUNI Loss Forecast API (<https://api.economy.com/muni/v1/>) has a single endpoint `/loss-forecast/{scenario}` that accepts a POST request (See "Scenario" section for enumeration of scenario codes). The following example is making a request using the baseline scenario specified as the last part of the request URL. The *Content-Type* of this request needs to be *application/json*.

The JSON payload needs to be in *raw* format (as opposed to *form-data*, *x-www-form-urlencoded*, etc.) and will need to have the following structure:

JSON array of objects, for each object passed in a corresponding object will be returned as output. Each request object in the array must contain either a CUSIP number -or- state, sector, rating -or- state, sector, pd(probability of default). You can include up to 100 objects in this array.

Example Request

Here is an example cURL request using OAuth Token::

```
curl -X POST \
  https://api.economy.com/muni/v1/loss-forecast/bl \
  -H 'Authorization: Bearer SrZ5UkbzPn432zqMLgV3Ja' \
  -H 'content-type: application/json' \
  -d '[
    {
      "cusip": "006089DA1"
    },
    {
      "state": "pa",
      "sector": "ws",
      "rating": "Aa1",
      "lgd": 0.43
    },
    {
      "state": "pa",
      "sector": "ws",
      "pd": 0
    }
  ]'
```



```
        ...
        0.00017208
    ],
    "c_pd_lag2q": [
        null,
        null,
        ...
        0.00017357
    ],
    "c_pd_lag3q": [
        null,
        null,
        ...
        0.00017357
    ],
    "c_pd_lag4q": [
        null,
        0.00000149,
        ...
        0.00017357
    ],
    "c_pd_lag5q": [
        0.00000149,
        0.00000298,
        ...
        0.00017357
    ]
    ]
}
],
"error": null
},
{
    "cusip": null,
    "rating": "Aa1",
    "vintage": null,
    "pd": null,
    "orgIds": null,
    "state": "pa",
    "sector": "ws",
    "lgd": 0.43,
    "sectors": null,
    "maturityDate": null,
    "output": [
        {
            "sector": "ws",
            "vintage": "2019Q4",
            "overlay": 1,
            "yq": [
                "2018q4",
                "2019q1",
                ...
                "2047q4"
            ],
            "pd": [
                0.000005945,
                0.000006038,
                ...
                0.000006087
            ],
            "lr": [
```

```
        0.00000255635,  
        0.00000259634,  
        ...  
        0.00000261741  
    ],  
    "clr": [  
        6.407e-7,  
        0.0000012814,  
        ...  
        0.0000772495  
    ],  
    "c_pd": [  
        0.00000149,  
        0.00000298,  
        ...  
        0.00017965  
    ],  
    "c_pd_lag1q": [  
        null,  
        null,  
        ...  
        0.00017208  
    ],  
    "c_pd_lag2q": [  
        null,  
        null,  
        ...  
        0.00017357  
    ],  
    "c_pd_lag3q": [  
        null,  
        null,  
        ...  
        0.00017357  
    ],  
    "c_pd_lag4q": [  
        null,  
        0.00000149,  
        ...  
        0.00017357  
    ],  
    "c_pd_lag5q": [  
        0.00000149,  
        0.00000298,  
        ...  
        0.00017357  
    ]  
    }  
    ],  
    "error": null  
},  
{  
    "cusip": null,  
    "rating": "Aaa",  
    "vintage": null,  
    "pd": 0,  
    "orgIds": null,  
    "state": "pa",  
    "sector": "ws",  
    "lgd": 0.4,
```

```
"sectors": null,
"maturityDate": null,
"output": [
  {
    "sector": "ws",
    "vintage": "2019Q4",
    "overlay": 1,
    "yq": [
      "2018q4",
      "2019q1",
      ...
      "2047q4"
    ],
    "pd": [
      9.725e-7,
      0.000001021,
      ...
      9.381e-7
    ],
    "lr": [
      3.89e-7,
      4.0840000000000003e-7,
      ...
      3.7524e-7
    ],
    "clr": [
      9.536e-8,
      1.9072e-7,
      ...
      0.000011156
    ],
    "c_pd": [
      2.384e-7,
      4.768e-7,
      ...
      0.00002789
    ],
    "c_pd_lag1q": [
      null,
      null,
      ...
      0.00017208
    ],
    "c_pd_lag2q": [
      null,
      null,
      ...
      0.00017357
    ],
    "c_pd_lag3q": [
      null,
      null,
      ...
      0.00017357
    ],
    "c_pd_lag4q": [
      null,
      0.00000149,
      ...
      0.00017357
    ]
  }
]
```

```

    ],
    "c_pd_lag5q": [
      0.00000149,
      0.00000298,
      ...
      0.00017357
    ]
  }
],
"error": null
}
]

```

property	description
cusip	CUSIP number specified in input or <code>null</code> if input object did not specify a <code>cusip</code> property
rating	Estimated Moody's Investors Service Credit Rating
vintage	vintage
pd	probability of default specified in input or <code>null</code> if input did not specify a <code>pd</code> property
orgIds	Organization Ids
state	<code>state</code> value specified in input or <code>IUSA</code> if input object did not specify a <code>state</code> property
sector	sector specified in input or <code>LG</code> if input object did not specify a <code>sector</code> property
sectors	When CUSIP number is used as input, multiple sectors maybe returned, in that case each sector will be listed in this array
lgd	Loss given default value
maturityDate	maturity date or <code>null</code>
output	Is an array of forecast information broken down by sector, each object has the following properties <code>sector</code> , <code>overlay</code> , <code>yq</code> (quarterly dates), <code>pd</code> (probability of default), <code>lr</code> (loss rate), <code>c_pd</code> (cumulative probability of default), <code>c_pd_lag1q</code> (cumulative probability of default 1 quarter ago), <code>c_pd_lag2q</code> (cumulative probability of default 2 quarters ago), <code>c_pd_lag3q</code> (cumulative probability of default 3 quarters ago), <code>c_pd_lag4q</code> (cumulative probability of default 4 quarters ago), <code>c_pd_lag5q</code> (cumulative probability of default 5 quarters ago), <code>vintage</code>
error	<code>null</code> if successful otherwise description of error

CUSIP

CUSIP numbers consist of nine characters (including letters and numbers) that uniquely identify a company or issuer and the type of financial instrument. If a request is made using a CUSIP number all other properties will be ignored. For users with limited access, `cusip` is not a valid input.

Scenarios

Each scenario has a corresponding code that can be specified in the request URL. The default scenario is `baseline(b1)` and does not have to be included in the URL

code	title
b1	baseline
s0	scenario 0 - exceptionally strong growth
s1	scenario 1 - stronger near-term rebound
s2	scenario 2 - slower near-term recovery
s3	scenario 3 - moderate recession
s4	scenario 4 - protracted slump
s5	scenario 5 - below-trend long-term growth
s6	scenario 6 - stagflation
s7	scenario 7 - next-cycle recession
s8	scenario 8 - low oil price

Sectors

Each sector has a corresponding code that can be put in the request body. If sector is not specified or its empty it will default to 'LG'. For users with limited access, valid input for state is either 'lg' or empty string.

Sector code	Sector title
ap	Airports
hc	Healthcare
he	Higher Education
hs	Housing
lg	Local Government
np	Not for Profit
pp	Public Power
pt	Ports
st	States
tf	Toll Facilities
ws	Water & Sewer

State

Each state has a corresponding 2-letter code used by the United States Postal Service that can be put in the request body. If state is not specified or its empty it will default to 'IUSA'. For users with limited access, valid input for sector is either 'IUSA' or empty string.

e.g. PA = Pennsylvania

There are three non-state regions that can be passed in via the `state` property

DC = Washington D.C.

PR = Puerto Rico

IUSA = Average of all US states

Ratings

Moody's Rating can be put in the request body when using state, sector and rating to pull forecast data.

Moody's Rating
Aaa
Aa1
Aa2
Aa3
A1
A2
A3
Baa1
Baa2
Baa3
Ba1
Ba2
Ba3
B1
B2
B3
Caa1
Caa2
Caa3
Ca
C

Loss Given Default (LGD)

Loss Given default can be set via query string value(`1gd`) or as a property(`1gd`) on each object in the input array. If it is not specified a default value will be used to calculate `1r` and `c1r` values. In the case that the `1gd` value is set on the query string as well as in the input object the property in the input object will be used for all calculations.

Vintage

Vintage can only be set as a query string parameter(`vintage`). If the parameter is not set it will default to the most recent data available. Vintage must be in the following format(`YYYYMM`). For example July 2019 would be `201907`

Revision

Revision can only be set as a query string parameter(`revision`). It is an optional parameter. Revision must be an integer, for example 1,2,etc.

Errors

message	explanation
either rating or pd required when cusip is not provided	either rating or pd required when cusip is not provided
invalid rating provided	only valid Moodys Ratings are accepted(see ratings table)
invalid state provided	only 2-letter postal codes or <code>IUSA</code> will be accepted
invalid sector provided	only 2-letter sector codes accepted(see sectors table)
invalid scenario {invalid-scenario}	use scenario code provided in scenario table
invalid vintage	vintage is outside the range of the data
invalid revision	provided revision is not available for the given vintage
cusip not found: {cusip}	No information found
long-term debt rating could not be found	No long Term Debt rating provided
rating is withdrawn	WR rating