

# QRATE API User Guide

version 1.6.0

## Authentication Instructions

Qrate API supports two forms of authentication:

1. HMAC Signature
2. OAuth 2.0 Token

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

**HAMC 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 QRATE 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/data/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 QRATE API (<https://api.economy.com/qrate/v1>) has a single endpoint `/sector/{sector code}` that accepts a POST request (See "Sector List" section for enumeration of sector codes). 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 property:

1. A **inputs** array (See "Model Input Values By Sector" section for enumeration, input values vary based on sector). The API allows the user to pass in up to 3 custom values in the **inputs** array that can be used to link the request with the response, using an ID or a GUID.

*NOTE:* Each sector may have different accepted property names. e.g. the JSON payload for the Airports(ap) sector does not necessarily contain the required properties for the Healthcare(hc) sector.

### Example Request

Here is an example cURL request for the Airports(AP) sector using OAuth Token:

```
curl -X POST \
  https://api.economy.com/qrate/v1/sector/ap \
  -H 'Authorization: Bearer SrZ5UkbzPn432zqMLgV3Ja' \
  -H 'Content-Type: application/json' \
  -d '{
    "inputs": [
      {
        "tot_enplan": 16066.8,
        "carrier_base": 26.9,
        "debt_usd_enplan_pass": 95.33,
        "cash_on_hand": 565,
        "stability_of_cost": 13.78,
        "income_per_capita": 66074,
        "total_pop": 776.7,
        "airport_type": "Origin and Destination",
        "user_input_1" : "Test Value"
      },
      {
        "tot_enplan": 32455,
        "carrier_base": 79.8028,
        "debt_usd_enplan_pass": 175.6145,
        "cash_on_hand": 637.0082,
        "stability_of_cost": 8.75,
        "income_per_capita": 53285,
        "total_pop": 90.672,
        "airport_type": "Connecting Hub",
        "user_input_1" : "Test Value",
        "user_input_2" : "Test Value",
        "user_input_3" : "Test Value"
      }
    ]
  }'
```

## Response

The response for the API is a JSON array that has the same number of objects as the request *inputs* array.

```
[
  {
    "qscore": 5.1517763749488292,
```

```

    "rating": "A1.Q",
    "pd": 0.000058,
    "lr": 0.000032,
    "error": null,
    "user_input_1" : "Test Value",
    "user_input_2": null,
    "user_input_3": null
  },
  {
    "qscore": 6.2734025003772995,
    "rating": "A2.Q",
    "pd": 0.000109,
    "lr": 0.00006,
    "error": null,
    "user_input_1" : "Test Value",
    "user_input_2" : "Test Value",
    "user_input_3" : "Test Value"
  }
]

```

property	description
qscore	Q-Score
rating	Estimated Moody's Investors Service Credit Rating
pd	1 yr ahead probability of default
lr	1 yr ahead expected loss rate
error	null if successful otherwise description of error
user_input_1	custom value entered by user in input or null
user_input_2	custom value entered by user in input or null
user_input_3	custom value entered by user in input or null

## Sectors

Each sector has a corresponding code that must be put in the request URL.

Sector code	Sector title
ap	Airports
hc	Healthcare
he-k12	Higher Education K-12
he-pvt	Higher Education Private
he-pub	Higher Education Public
hs	Housing
lg	Local Government
np	Not for Profit
pp	Public Power
pt	Ports
st	States
tf	Toll Facilities
ws	Water & Sewer

## Model Input Values By Sector

All sector input provide upto 3 custom values that can be entered by user to link the request with response.

Property name	Description
user_input_1	(Optional) Custom property to link request with response
user_input_2	(Optional) Custom property to link request with response
user_input_3	(Optional) Custom property to link request with response

*NOTE:* All properties listed below are required.

### Airports (ap)

Property name	Name	Description
airport_type	Airport Type	Measure of airport activity representing the total number of passengers boarding aircraft at a given airport. one of the following values: Origin and Destination , Connecting Hub
carrier_base	Primary carrier market share (%)	Percent of total emplanements by primary carrier. (Primary Carrier/Total Emplanemnet)*100
cash_on_hand	Days cash on hand	The ratio of cash and investments available to pay expenses to total operating expenses multiplied by 365 days.
debt_usd_enplan_pass	Debt per enplaned passenger (\$)	No
income_per_capita	Income per capita (USD)	Per capita personal income for the airport's primary county, according to the U.S. Census Bureau.
stability_of_cost	Airline payments per enplanement	Total payments received from airlines divided by the number of enplaned passengers.
total_pop	Total Population ('000)	The population of the airport's primary county, according to the U.S. Census Bureau.
tot_enplan	Total emplanements ('000)	Measure of airport activity representing the total number of passengers boarding aircraft at a given airport.

### Healthcare (hc)

Property name	Name	Description
days_cash	Days Cash on Hand	A liquidity measure, this ratio measures the number of days that a hospital is able to operate (cover its cash operating expenses) from current unrestricted cash and investments if no additional cash is collected. (Unrestricted cash and investments x 365) / (total operating expenses - depreciation and amortization expenses)
margin	Operating Cash Flow Margin (%)	A measure of profitability, this ratio measures a hospital's ability to cover cash operating expenses with cash flows generated from operations. (Total operating revenue - total operating expenses + interest expense + depreciation and amortization expenses) / total operating revenue

Property name	Name	Description
medicare_of_gross_revenue	Medicare (% of Gross Revenue)	Medicare managed care gross patient charges divided by total gross patient charges
op_rev	Operating Revenue (\$000)	Sum of all patient service revenues, grants and contracts, appropriations, premia, taxes, contributions, net assets released from restrictions, and other operating revenue.
organization_type	Type of Organization	Type of organization. one of the following values: academic medical system, children's hospital, human service provider, multi-state system, single-state system, specialty hospital, standalone facility, or other
pop_65	Population Aged 65 and over (% of Total Population)	Share of residents aged 65 and over in the entity's primary county, according to the U.S. Census Bureau.
tot_cash_debt	Unrestricted Cash and Investments to Total Debt (%)	(Unrestricted cash + short-term investments + board-designated cash and investments) / (long-term debt + short-term debt + capital leases)

### Higher Education K-12 (he-k12)

Property name	Name	Description
op_rev	Operating Revenue (\$000)	Total adjusted operating revenue as stated in audit, plus 5% of trailing average three year cash and investments level, less net assets released for capital, less realized and unrealized gains or losses. Individual colleges may have other adjustments made to operating revenues based on additional information not included in audit.
spend_cash	Spendable Cash & Investments to Operating Expenses (x)	Cash and Investments plus funds held in trust by others plus pledges receivable reported in permanently restricted net assets, less funds permanently restricted by third parties, divided by operating expenses
ypc_pci	Annual Growth in Per Capita Income (USD) (%)	Annual growth in per capita income of the entity's primary county, according to the U.S. Census Bureau.

### Higher Education Private (he-pvt)

Property name	Name	Description
days_cash	Monthly Days Cash on Hand (x)	Measures the number of days a university is able to operate (cover its cash operating expenses) from unrestricted cash and investments that can be liquidated within one month. Monthly liquidity times 365 divided by total expenses less depreciation and additional, unusually large non-cash expenses
max_contrib	Maximum Revenue Contribution (%)	Maximum revenue contribution from gifts, grants and contracts, investment income, patient care, tuition and auxiliaries, or other sources as a share of total revenue. Generally, greater revenue diversity is a credit positive, reducing a university's vulnerability to fluctuations in any single revenue source.

Property name	Name	Description
op_rev	Operating Revenue (\$000)	Total adjusted operating revenue as stated in audit, plus 5% of trailing average three year cash and investments level, less net assets released for capital, less realized and unrealized gains or losses. Individual colleges may have other adjustments made to operating revenues based on additional information not included in audit.
pop_15_to_24	Population Aged 15 to 24 (% of Total Population)	Share of residents aged 15-24 in the entity's primary county, according to the U.S. Census Bureau.
private_he_type	Private HE System Characteristics	Type of higher education entity. One of the following values: comprehensive private university, moderate sized private university, small private college or specialty school.
spend_cash	Spendable Cash & Investments to Operating Expenses (x)	Cash and Investments plus funds held in trust by others plus pledges receivable reported in permanently restricted net assets, less funds permanently restricted by third parties, divided by operating expenses.
spend_cash_debt	Spendable Cash & Investments to Total Debt (x)	Measures the university's ability to repay bondholders from wealth that can be accessed over time or for a specific purpose. Cash and investments plus funds held in trust by others plus pledges receivable reported in permanently restricted net assets, less funds permanently restricted by third parties, divided by total debt.

### Higher Education Public (he-pub)

Property name	Name	Description
days_cash	Monthly Days Cash on Hand (x)	Total adjusted operating revenue as stated in audit, plus 5% of trailing average three year cash and investments level, less net assets released for capital, less realized and unrealized gains or losses. Individual colleges may have other adjustments made to operating revenues based on additional information not included in audit.
gift_rev	Three-Year Average Gifts per Student (\$)	Three year average of total gift revenue (unrestricted, temporarily restricted, and permanently restricted) per student.
max_contrib	Maximum Single Contribution (%)	Maximum revenue contribution from gifts, government appropriations, grants and contracts, investment income, patient care, tax revenue, tuition and auxiliaries, or other sources as a share of total revenue. Generally, greater revenue diversity is a credit positive, reducing a university's vulnerability to fluctuations in any single revenue source.
op_rev	Operating Revenue (\$000)	Total adjusted operating revenue as stated in audit, plus 5% of trailing average three year cash and investments level, less net assets released for capital, less realized and unrealized gains or losses. Individual colleges may have other adjustments made to operating revenues based on additional information not included in audit.
public_he_type	Public HE System Characteristics	Type of higher education entity. One of the following values: comprehensive public university, moderate sized public university, small public university, community college, specialty school, OR not defined.

Property name	Name	Description
spend_cash	Spendable Cash & Investments to Operating Expenses (x)	Cash and Investments plus funds held in trust by others plus pledges receivable reported in permanently restricted net assets, less funds permanently restricted by third parties, divided by operating expenses
state_rating	State Rating	Measures the university's ability to repay bondholders from wealth that can be accessed over time or for a specific purpose. Cash and investments plus funds held in trust by others plus pledges receivable reported in permanently restricted net assets, less funds permanently restricted by third parties, divided by total debt. Valid choices: Aaa , Aa1 , Aa2 , Aa3 , A1 , A2 , A3 , Baa3 , Baa2 , Baa1 , Ba1 , Ba2 , Ba3 , B1 , B2 , B3 , Caa3 , Caa2 , Caa1 , Ca , C

## Housing (hs)

Property name	Name	Description
bs_strength_lag	Balance sheet strength	Total adjusted assets, expressed by the sum of current and long-term assets, divided by the value of all outstanding bonds.
st	State	Dummy variable that specifies the state in which the issuer is located.
type_dum	Subsector	Dummy variable denoting whether the subsector is single-family or combined. One of the following values SFP or CM

## Local Government (lg)

Property name	Name	Description
cash_bal	Net Cash Balance (\$000)	Cash and investments, less cash flow notes (TANs, RANs and TRANs) and other operating loans.
debt_pension_op_rev_m	Debt and pension liabilities as a % of revenues	A three year average of Moody's Adjusted Net Pension Liabilities (ANPLs) plus the entity's net direct debt, all divided by current year operating revenues. Net Direct Debt typically include the non-self supporting portion of the government's general obligation bonds, sales and special tax bonds, general fund lease obligations, bond anticipation notes, and capital leases.
fund_bal_percent_rev	Fund Balance as % of Revenues	Available fund balance divided by operating revenues.
median_inc_ratio	Median Household Income (as % of US median)	Median household income in the entity's primary county as a share of U.S. median household income, according to the U.S. Census Bureau.
sub_sector	Specified when selecting a sector	The subsector should be selected up top when the sector is selected. one of the following values: City , County , School District , Community College District , Parks and Recreation District , Other Special District .

Property name	Name	Description
tot_full_value	Total Full Value (\$'000)	Estimated full market value of all taxable property within the boundaries of the local government as reported by local or state sources. Users of these data should be aware of significant variation in the methods and quality of property assessment from state to state and even among the municipal governments within a state. Definitions of taxable property also vary across the country, as does the dependability of equalization ratios used to convert assessed value to full value.
total_num_households	Total Number of Households ('000)	Number of households in the entity's primary county, according to the U.S. Census Bureau.

### Not for Profit (np)

Property name	Name	Description
annual_growth_pop	Annual Growth in Total Population (%)	Annual growth in the population of the entity's primary county, according to the U.S. Census Bureau
exp_debt	Expendable financial resources-to-direct debt (x)	A three year average of Moody's Adjusted Net Pension Liabilities (ANPLs) plus the entity's net direct debt, all divided by current year operating revenues. Net Direct Debt typically include the non-self supporting portion of the government's general obligation bonds, sales and special tax bonds, general fund lease obligations, bond anticipation notes, and capital leases.
margin	Operating Cash Flow Margin (%)	Indicates the excess cash flow margin (or deficit) by which annual cash flow covers operating expenses. Adjusted total unrestricted revenues (adjustments include limiting investment income to 5% of average of previous three years cash and investments and subtracting net assets released for construction and acquisition of fixed assets), less total unrestricted operating expenses, plus depreciation plus interest plus other large non-cash expenses, divided by adjusted total unrestricted revenues
tot_cash	Total Cash & Investments (\$, in millions)	Measure base of assets that generate investment return.

### Ports (pt)

Property name	Name	Description
days_cash	Days cash on hand	A liquidity measure, this ratio measures the number of days that a port is able to cover its cash operating expenses from current unrestricted cash and investments if no additional cash is collected $(\text{Unrestricted cash and investments} \times 365) / (\text{total operating expenses} - \text{depreciation and amortization expenses})$ .
oper_rev	Total operating revenue	Operating revenue from all sources, including airfield and parking, concessions, other rentals and other airport operating revenues, maritime, port rentals, cruise revenues, and other port operating revenues.
st	State	Dummy variable that specifies the state in which the port is located.
type_dum	Port type	Dummy variable that specifies the type of port. One of the following values: operator or Landlord .



## Public Power (pp)

Property name	Name	Description
days_cash	Days cash on hand	This ratio measures the number of days that an issuer is able to cover its cash operating expenses from current unrestricted cash and investments if no additional cash is collected (unrestricted cash and investments x 365)/(total operating expenses - depreciation and amortization expenses).
debt_ratio	Five-year average debt ratio	Net funded debt divided by the sum of net fixed assets and net working capital.
oper_rev	Operating revenue	Electric operating revenues plus other operating revenues.
pop	Total population	The population of the entity's primary county as defined by the U.S. Census Bureau.
region	Region	Dummy variable that identifies an issuer's North American Electric Reliability Corp. region or whether an issuer is located in a U.S. territory. One of the following values: ECAR , ERCOT , FRCC , MAAC , MAIN , MAPP , NPCC , SERC , SPP , Territory , OR WECC
type	Type	Dummy variable that identifies the type of public power utility. One of the following values: Distributor , Generator , JAA - all requirements , OR JAA - take or pay project .

## States (st)

Property name	Name	Description
anpl	Adjusted net pension liability	The difference between the fair market value of a pension plan's assets and its liabilities, as adjusted by Moody's Investors Service.
g_pop	State population	Yr-over-yr growth in total state population.
rdiva	Industrial diversity	Index of industrial diversity relative to the U.S.
rvo1q	Employment volatility	Index of state employment volatility relative to the U.S.

## Toll Facilities (tf)

Property name	Name	Description
asset_type	Asset mix type	Dummy variable that identifies type of toll facility. One of the following values: Multi-Asset OR Single-Asset .
cash_exp_ratio	Cash-to-expenses ratio	The ratio of total cash to total expenses.
dscr	Total debt service coverage	Annual operating revenues, less operating expenses (excluding depreciation), divided by annual total debt service costs for all liens of debt.
geo_type	Geographical distribution type	Dummy variable that identifies geographical distribution of toll facility. One of the following values: Regional OR State-wide .
pc_gdp	GDP per capita	Real gross domestic product of the entity's primary county divided by the total population of the primary county as defined by the U.S. Census Bureau.

## Water & Sewer (ws)

Property name	Name	Description
cash_on_hand	Days Cash on Hand	A liquidity measure, this ratio measures the number of days that an entity is able to operate from current unrestricted cash and investments if no additional cash is collected. Total cash, cash equivalents and investments divided by total operating and maintenance expenses divided by 365.
debt_to_rev	Net funded debt as a % of revenues	Net funded debt (total current and non-current debt, minus debt service and debt service reserve funds) divided by total operating revenue (aggregate revenues derived from sales to service area customers (retail and wholesale), not including interest income, connection fees, grants or other non-recurring revenues).
median_inc_ratio	Fund Balance as % of Revenues	Median household income in the entity's primary county as a share of U.S. median household income, according to the U.S. Census Bureau.
tot_annual_debt_srvs	Total Annual Debt Service (\$000)	The aggregate of all principal and interest payments (excluding capitalized interest) for the fiscal year, including both senior and subordinate lien obligations, capital leases and regular payments related to derivative agreements.