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Abstract

Your client wanted to know if financial companies are offering a better fixed deposit and saving  
deposit rates compared to banks. They also want to know if interest rates are on upward or  
downtrend over time. They heard about APIs provided by Monetary Authority of Singapore  
(MAS) which provides monthly interest rates of banks and financial companies.

Technical Assignment

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# Example - calling MAS REST api to generate interestRate/finanical reports

## GitHub URL

<https://github.com/SantoKoh/MASApi>

## Requirements

\* [Java Platform (JDK) 8](http://www.oracle.com/technetwork/java/javase/downloads/index.html)

\* [Apache Maven 3.x](http://maven.apache.org/)

## Design Concept

|  |
| --- |
| 1. Source code will be safe in GitHub. 2. Maven is used for the build management tool. 3. Spring Core is used for Design Pattern such as Dependency injection or inversion of control (IOC). 4. Interface and Abstract class are used in the application for the business workflow processing. 5. InterestRate (Main Object) -> Result -> Records are object used for the application. Object Relational Mapping (ORM) is not used in this application. Record object will contain both end\_of\_year and end\_of\_month for easy of program used. 6. Processor is an interface class and can be used to implement the two different report processing (business logic) type (monthly, yearly). 7. ProcessorImpl is an abstract class to force the implementation of `extractData` method and the variables object by its inheritance class, it also encapsulate `generateReport` method and variables. 8. enum object is used and that is mapped to the Spring configuration beans for the implementation ProcessorImpl class. Eg. ReportTypeEnum.monthly\_report will get the Spring bean ProcessorMonthlyImpl, ReportTypeEnum.yearly\_report will get the Spring bean ProcessorYearlyImpl. 9. ReportGenerator is a interface class and can be used to implement different reports type, passing the data objects (InterestRate->Result->Records) to output the desired report. |

## Quick start

|  |
| --- |
| 1. `mvn install`   $ mvn install   1. to run --> `java -jar target/MASApi-1.0-SNAPSHOT.jar report.type=M start.date=Jan-2018 end.date=Aug-2018 display.type=1,3-4,9`   $ java -jar target/MASApi-1.0-SNAPSHOT.jar report.type=M start.date=Jan-2018 end.date=Aug-2018 display.type=1,3-4,9   1. to export the report to a file, you may use append mode '> masreport.log', `java -jar target/MASApi-1.0-SNAPSHOT.jar report.type=M start.date=Jan-2018 end.date=Aug-2018 display.type=1,3-4,9 > masreport.log`   $ java -jar target/MASApi-1.0-SNAPSHOT.jar report.type=M start.date=Jan-2018 end.date=Aug-2018 display.type=1,3-4,9 > masreport.log   1. to display the report file, window dos -> `type masreport.log` , linux -> `cat masreport.log` 2. arguments input eg.   i) report.type=M [M=monthly, m=monthly, Y=yearly, y=yearly]  iI) start.date=Jan-2018 [MMM-yyyy]  iii) end.date=Aug-2018 [MMM-yyyy]  iv) isplay.type=1,3-4,9 [1-11 only, support range input '-' with comma separator ] |

## Assumption

|  |
| --- |
| 1. RESOURCE\_ID = `5f2b18a8-0883-4769-a635-879c63d3caac` for monthly, `bd841397-108f-4644-8da3-38a7c159d68a` for yearly 2. Only support 2 report types, the report will go by ascending order, when the trend is up it will have a '+' beside the percentage and '-' if it is going down from previous month/year rates. 3. The program does not use Database or Filesystem to store data, if required DAO (Data Access Object) can be used. 4. There is no properties variables used, the variables are in constants class, if required, it can be changed to load from properties using Spring Configuration. 5. Application does not have retry setting for REST API to MAS website if it fails to connect with 200 status, it also doesn't implement readtimeout setting, leaving it to default. 6. Date input range will be in MMM-yyyy format regardless of monthly or yearly report. In the event of yearly report, the year will be extract, therefore DEC-2015 to JAN-2017 represents report inclusive of year 2015,2016,2017 |

## MANIFEST

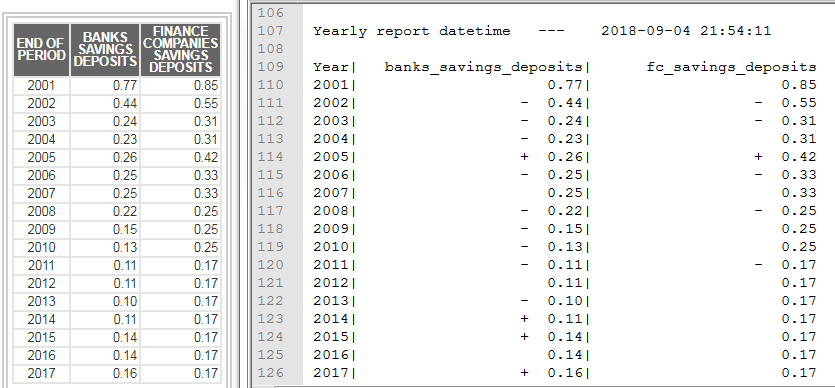
|  |
| --- |
| META-INF/  META-INF/MANIFEST.MF  com/  com/ks/  com/ks/masapi/  com/ks/masapi/connector/  com/ks/masapi/constants/  com/ks/masapi/exception/  com/ks/masapi/model/  com/ks/masapi/model/option/  com/ks/masapi/processor/  com/ks/masapi/processor/impl/  com/ks/masapi/report/  com/ks/masapi/report/impl/  com/ks/masapi/util/  com/ks/masapi/connector/RestClientConnector.class  com/ks/masapi/constants/AppConstants$RecordTypeEnum.class  com/ks/masapi/constants/AppConstants$ReportTypeEnum.class  com/ks/masapi/constants/AppConstants.class  com/ks/masapi/exception/AppException.class  com/ks/masapi/MainClass.class  com/ks/masapi/model/InterestRate.class  com/ks/masapi/model/option/ArgumentOption.class  com/ks/masapi/model/option/RecordTypeOption.class  com/ks/masapi/model/Record.class  com/ks/masapi/model/Result.class  com/ks/masapi/processor/impl/ProcessorImpl.class  com/ks/masapi/processor/impl/ProcessorMonthlyImpl.class  com/ks/masapi/processor/impl/ProcessorYearlyImpl.class  com/ks/masapi/processor/Processor.class  com/ks/masapi/report/impl/ReportMonthly$1.class  com/ks/masapi/report/impl/ReportMonthly.class  com/ks/masapi/report/impl/ReportYearly$1.class  com/ks/masapi/report/impl/ReportYearly.class  com/ks/masapi/report/ReportGenerator.class  com/ks/masapi/util/JsonHelper.class  log4j.properties  MASApi-context.xml  META-INF/maven/  META-INF/maven/com.ks/  META-INF/maven/com.ks/MASApi/  META-INF/maven/com.ks/MASApi/pom.xml  META-INF/maven/com.ks/MASApi/pom.properties |

## display.type list

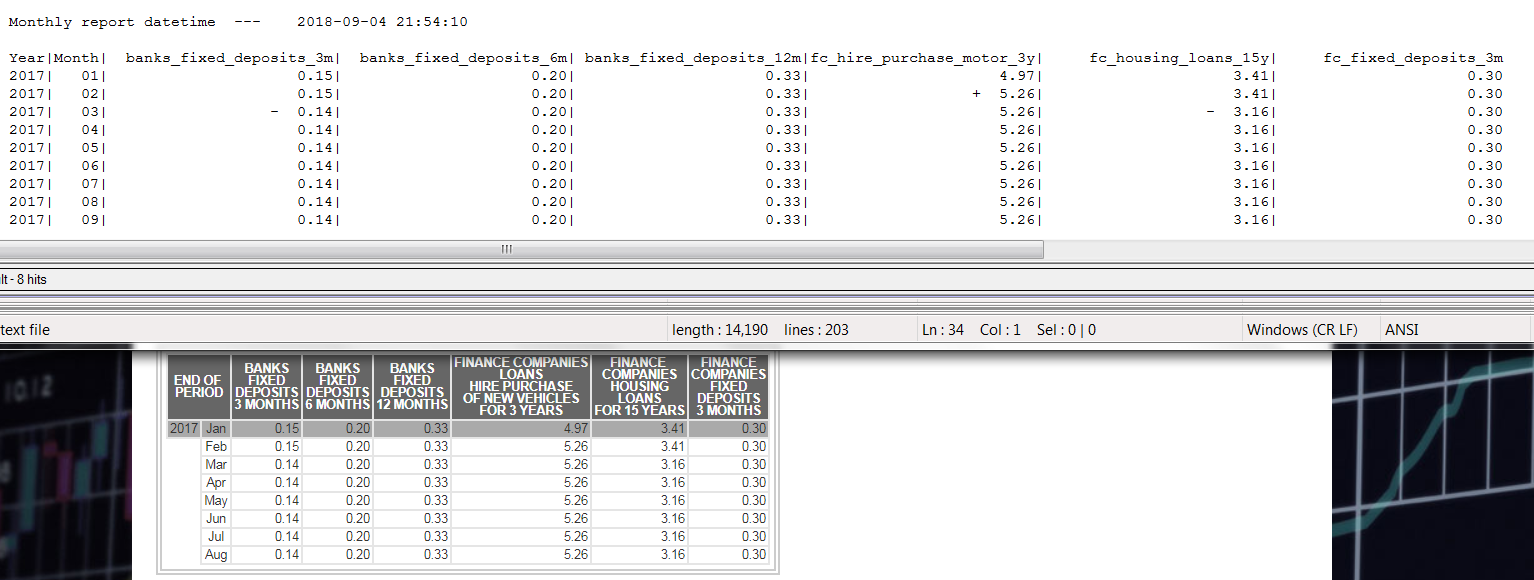
|  |
| --- |
| 1 prime\_lending\_rate Prime Lending Rate  2 banks\_fixed\_deposits\_3m Banks Fixed Deposits 3 Months  3 banks\_fixed\_deposits\_6m Banks Fixed Deposits 6 Months  4 banks\_fixed\_deposits\_12m Banks Fixed Deposits 12 Months  5 banks\_savings\_deposits Banks Savings Deposits  6 fc\_hire\_purchase\_motor\_3y Finance Companies Loans - Hire Purchase of New Vehicles For 3 Years  7 fc\_housing\_loans\_15y Finance Companies Housing Loans For 15 Years  8 fc\_fixed\_deposits\_3m Finance Companies Fixed Deposits 3 Months  9 fc\_fixed\_deposits\_6m Finance Companies Fixed Deposits 6 Months  10 fc\_fixed\_deposits\_12m Finance Companies Fixed Deposits 12 Months  11 fc\_savings\_deposits Finance Companies Savings Deposits |

## Compare result from MAS website

Yearly report, validating against MAS website



Monthly report, validating against MAS website



## Unit Test Cases

|  |  |  |
| --- | --- | --- |
| InvalidOptionTest | | |
| **Test Case** | **Description of test** | **Result** |
| testErrorInput01Test | Test invalid input, args is empty  There will be a display of Help information display on the screen together with an exception thrown at the end. | Exception thrown  "Empty input options" |
| testErrorInput02Test | Test invalid input for report type - empty  " start.date=Jul-2017 end.date=Mar-2017 display.type=2" | Exception thrown  "Missing or invalid input report type [m-monthly, y-yearly]" |
| testErrorInput03Test | Test invalid input for report type 'X' valid one is Yy Mm  "report.type=x start.date=Jul-2017 end.date=Mar-2017 display.type=3" | Exception thrown  "Missing or invalid input report type [m-monthly, y-yearly]" |
| testErrorInput04Test | Test invalid input 'aaa-2017' for start.date MMM-yyyy  "report.type=m start.date=aaa-2017 end.date=Mar-2017 display.type=3" | Exception thrown  "Missing or invalid input date range" |
| testErrorInput05Test | Test invalid input 'JUL-18' for end.date MMM-yyyy  "report.type=Y start.date=JUL-2017 end.date=Mar-18 display.type=3" | Exception thrown  "Missing or invalid input date range" |
| testErrorInput06Test | Test invalid input start.date is earlier than end.date  "report.type=M start.date=Jul-2017 end.date=Mar-2017 display.type=2" | Exception thrown  "Missing or invalid input date range" |
| testErrorInput07Test | Test invalid input, the display record option must be a valid number, it supports range 1-4 with comma separator  "report.type=M start.date=Jan-2017 end.date=Sep-2017 display.type=X,1,E" | Exception thrown  "Invalid input display report column" |
| testErrorInput08Test | Test invalid input for display type (1-11), input is 12  "report.type=M start.date=Jul-2017 end.date=Mar-2017 display.type=12" | Exception thrown  "Invalid input display report column" |
| testErrorInput09Test | Test invalid input for display type (1-11), input is 0  "report.type=M start.date=Jul-2017 end.date=Mar-2017 display.type=0" | Exception thrown  "Invalid input display report column" |

|  |  |  |
| --- | --- | --- |
| MonthlyReportTest – calling from the MainApp class | | |
| **Test Case** | **Description of test** | **Result** |
| testMonthlyRpt01Test | Testing valid case for Jan to Aug 2018, display 1,3,9  "report.type=M start.date=Jan-2018 end.date=Aug-2018 display.type=1,3,9" | Monthly report generated on Screen for Display column 1,3,9 from Jan to Aug 2018 |
| testMonthlyRpt02Test | Testing valid case for Jan to Dec 2017, display 2,3,4,6,7,8  "report.type=M start.date=Jan-2017 end.date=Sep-2017 display.type=2-4,6,7-8" | Monthly report generated on Screen for Display column 2,3,4,6,7,8 from Jan to Sep 2017 |
| testMonthlyRpt03Test | Testing valid case for Jan to Sep 2017, display 5,11  "report.type=Y start.date=Jan-2000 end.date=DEC-2017 display.type=11,5" | Monthly report generated on Screen for Display column 5,11 from Jan to Sep 2017 |

|  |  |  |
| --- | --- | --- |
| YearlyReportTest – calling from the MainApp class | | |
| **Test Case** | **Description of test** | **Result** |
| testYearlyRpt01Test | Testing valid case for Jan to Aug 2018, display 1,3,9  "report.type=Y start.date=Jan-2000 end.date=Aug-2005 display.type=1,3,9" | Yearly report generated on Screen for Display column 1,3,9 from Jan to Aug 2018 |
| testYearlyRpt02Test | Testing valid case for Jan to Dec 2017, display 2,3,4,6,7,8  "report.type=y start.date=Jan-1990 end.date=Dec-2017 display.type=2-4,6,7-8" | Yearly report generated on Screen for Display column 2,3,4,6,7,8 from Jan to Sep 2017 |
| testYearlyRpt03Test | Testing valid case for Jan to Sep 2017, display 5,11  "report.type=Y start.date=Jan-2000 end.date=DEC-2017 display.type=11,5" | Yearly report generated on Screen for Display column 5,11 from Jan to Sep 2017 |

|  |  |  |
| --- | --- | --- |
| DataTest– validation data from test resource folder | | |
| **Test Case** | **Description of test** | **Result** |
| testData01Test | Testing valid case for Monthly report Jan to Aug 2018, display report column 1,3,9  , validating base on a single line of the test resource folder /report/testData01.txt  "report.type=Y start.date=Jan-2000 end.date=Aug-2005 display.type=1,3,9" | Validate single line content from the test resource folder  "2018| 08| 5.33| 0.23| - 0.00" |
| testData02est | Testing valid case for Yearly report Jan 1990 to Dec 2017, display report column 2,3,4,6,7,8 , validating base on a single line of the test resource folder /report/testData02.txt  "report.type=y start.date=Jan-1990 end.date=Dec-2017 display.type=2-4,6,7-8" | Validate single line content from the test resource folder  " 1998| - 1.72| - 2.08| - 2.51| - 6.99| + 7.31| - 1.85 " |
| testData03Test | Can check the json content due to the timestamp value, using total count to validate, test resource folder /report/testData03.txt  "report.type=M start.date=Jan-2018 end.date=Jul-2018 display.type=1-11" | Getting InterestRate object from MAS and compare to file loading from test resource folder. Checking total records as the content contain dynamic values [timestamp] |

# Appendix

**API Documentation**

**Syntax:**https://eservices.mas.gov.sg/api/action/datastore/search.json?resource\_id=<resource\_id>&<parameters>….

**Request Parameters**

|  |  |
| --- | --- |
| **Parameter Name** | **Description** |
| resource\_id | ID of the resource to be searched.  **Format:** resource\_id=<resource\_id>  **Example:** *resource\_id=10eafb90-11a2-4fbd-b7a7-ac15a42d60b6* |
| filters | Filters columns based on the specified values.  **Format:** filters[<field>]=<one or more values separated by comma>  **Example:** *filters[end\_of\_month]=2016-04,2016-05,2016-06* |
| between | Filters columns based on a range.  **Format:** between[<field>]=<lower value (inclusive)>,<higher value (inclusive)>  **Example:** *between[end\_of\_month]=2008-01,2010-12* |
| query | Returns records that contain the search string (only for fields with the “text” type).  **Format:** query=<string to search>  **Example:** *query=dollars* |
| offset | Number of rows to offset in the returned results.  **Format:** offset=<number of rows to offset>  **Example:** *offset=50* |
| limit | Maximum number of rows to return (default: 100).  The API will only return a maximum of 100 rows. If you wish to retrieve more than 100 rows, combine this with "offset" (refer to the examples below).  **Format:** limit=<maximum number of rows to return>  **Example:** *limit=10* |
| fields | Comma separated string of fields to return.  **Format:** fields=<field1>,<field2>….  **Example:** *fields=end\_of\_month,m1,m2,m3* |
| sort | The returned results will be sorted by this field.  **Format:** sort=<field1> <asc|desc>  **Example:** *sort=end\_of\_month desc* |

**Response Values (in JSON)**

|  |  |
| --- | --- |
| **Response Field** | **Description** |
| offset | Number of rows offset for the query. |
| limit | Maximum number of rows that is returned for the query. |
| total | Total number of rows matching the selected criteria. |
| records | List of matching results. |
| timestamp | (deprecated) This field is the current time expressed as the number of seconds that have elapsed since January 1,1970. Previously, this field represented the time the row was last updated, expressed as the number of the seconds that have elapsed since January 1, 1970. This field has been deprecated and will be removed in the near future. |

**Examples**The following examples are based on the [Exchange Rates data](https://secure.mas.gov.sg/msb/ExchangeRates.aspx) published on the MAS website.

**Return the 10 most recent records**

|  |
| --- |
| [https://eservices.mas.gov.sg/api/action/datastore/search.json?resource\_id=10eafb90-11a2-4fbd-b7a7-ac15a42d60b6&limit=10&sort=end\_of\_month desc](https://eservices.mas.gov.sg/api/action/datastore/search.json?resource_id=10eafb90-11a2-4fbd-b7a7-ac15a42d60b6&limit=10&sort=end_of_month%20desc) |

**Return the rows for Jan, Apr and Jul 2015**

|  |
| --- |
| [https://eservices.mas.gov.sg/api/action/datastore/search.json?resource\_id=10eafb90-11a2-4fbd-b7a7-ac15a42d60b6&limit=10&filters[end\_of\_month]=2015-01,2015-04,2015-07](https://eservices.mas.gov.sg/api/action/datastore/search.json?resource_id=10eafb90-11a2-4fbd-b7a7-ac15a42d60b6&limit=10&filters%5Bend_of_month%5D=2015-01,2015-04,2015-07) |

**Return the first 100 rows between the years 2005 and 2015 for USD, Euro and Yen vs the Singapore Dollar**

|  |
| --- |
| [https://eservices.mas.gov.sg/api/action/datastore/search.json?resource\_id=10eafb90-11a2-4fbd-b7a7-ac15a42d60b6&limit=100&fields=end\_of\_month,usd\_sgd,eur\_sgd,jpy\_sgd\_100&between[end\_of\_month]=2005-01,2015-12&sort=end\_of\_month asc](https://eservices.mas.gov.sg/api/action/datastore/search.json?resource_id=10eafb90-11a2-4fbd-b7a7-ac15a42d60b6&limit=100&fields=end_of_month,usd_sgd,eur_sgd,jpy_sgd_100&between%5Bend_of_month%5D=2005-01,2015-12&sort=end_of_month%20asc) |

**Return the next 100 rows between the years 2005 and 2015 for USD, Euro and Yen vs the Singapore Dollar**

|  |
| --- |
| [https://eservices.mas.gov.sg/api/action/datastore/search.json?resource\_id=10eafb90-11a2-4fbd-b7a7-ac15a42d60b6&limit=100&offset=100&fields=end\_of\_month,usd\_sgd,eur\_sgd,jpy\_sgd\_100&between[end\_of\_month]=2005-01,2015-12&sort=end\_of\_month asc](https://eservices.mas.gov.sg/api/action/datastore/search.json?resource_id=10eafb90-11a2-4fbd-b7a7-ac15a42d60b6&limit=100&offset=100&fields=end_of_month,usd_sgd,eur_sgd,jpy_sgd_100&between%5Bend_of_month%5D=2005-01,2015-12&sort=end_of_month%20asc) |

<https://secure.mas.gov.sg/api/APIDESCPAGE.ASPX?RESOURCE_ID=5f2b18a8-0883-4769-a635-879c63d3caac>

## **Fields**

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| No | Name | Title | Type | Unit Of Measure | Description |
| 1 | end\_of\_month | End of month | Datetime (Month) "YYYY-MM" |  |  |
| 2 | prime\_lending\_rate | Prime Lending Rate | Numeric (Percent) | % p.a. |  |
| 3 | banks\_fixed\_deposits\_3m | Banks Fixed Deposits 3 Months | Numeric (Percent) | % p.a. |  |
| 4 | banks\_fixed\_deposits\_6m | Banks Fixed Deposits 6 Months | Numeric (Percent) | % p.a. |  |
| 5 | banks\_fixed\_deposits\_12m | Banks Fixed Deposits 12 Months | Numeric (Percent) | % p.a. |  |
| 6 | banks\_savings\_deposits | Banks Savings Deposits | Numeric (Percent) | % p.a. |  |
| 7 | fc\_hire\_purchase\_motor\_3y | Finance Companies Loans - Hire Purchase of New Vehicles For 3 Years | Numeric (Percent) | % p.a. |  |
| 8 | fc\_housing\_loans\_15y | Finance Companies Housing Loans For 15 Years | Numeric (Percent) | % p.a. |  |
| 9 | fc\_fixed\_deposits\_3m | Finance Companies Fixed Deposits 3 Months | Numeric (Percent) | % p.a. |  |
| 10 | fc\_fixed\_deposits\_6m | Finance Companies Fixed Deposits 6 Months | Numeric (Percent) | % p.a. |  |
| 11 | fc\_fixed\_deposits\_12m | Finance Companies Fixed Deposits 12 Months | Numeric (Percent) | % p.a. |  |
| 12 | fc\_savings\_deposits | Finance Companies Savings Deposits | Numeric (Percent) | % p.a. |  |

## **Additional Notes**

Figures refer to average rates compiled from that quoted by 10 leading banks and finance companies.

## **API Examples**

## **Javascript example**

Making an ajax request with jQuery: 

var data = {

resource\_id:'5f2b18a8-0883-4769-a635-879c63d3caac',//the resource id

limit:5 //get 5 results

};

$.ajax({

url: 'https://eservices.mas.gov.sg/api/action/datastore/search.json',

data:data,

dataType:'json',

success:function(data){

alert('Total results found:'+ data.result.total)

}

});

## **Python Example**

import urllib.request

url = 'https://eservices.mas.gov.sg/api/action/datastore/search.json?resource\_id=5f2b18a8-0883-4769-a635-879c63d3caac&limit=5'

with urllib.request.urlopen (url) as req:

  print (req.read())