Fixed Income Database Design & Architecture

A Project

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By

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APPROVED:

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Abstract

No matter how good a portfolio manager is, she or he can not makes right investment decisions without the right information. It is all about data: how can many megabytes of data must be loaded into a continuously growing system, stored efficiently, and made easily accessible to all queries and to all applications? In this project, we build a decision database for managing a portfolio of fixed-income investments. We review the key features of the database architecture and describe key steps in processing the available date. In addition, we review some common analyses that are done by the portfolio manager by studying the report needed for a study of the investment duration at the sector level.

Acknowledgements

I would like to express my appreciation to Professor Heinricher for been so patience, advice on every detail process and enhancing the quality of the report.

I would also like to thank my friends at Blackrock and Lehman Brothers for their comments on the database structure and guidance for very practical reports that used in most finance companies. Most of all, I want to thank my family who have supported me in everything I do.

1. Introduction

Money markets are changing every moment of every day and investment managers must make decisions in this dynamic environment. The decisions involve large sums of money and the manager must be able to explain the choices for investment, as well as why they have refrained from buying certain securities. In order to support their decisions, they must be able to report the actual performance, how the performance was achieved, how assets were allocated, durations for sets of investments viewed at the sector level, as well as many other different views of complex data. They must be able to compare their portfolio's performance relative to different benchmark indices based on the information they have in their system.

There are so many ways to collect information from data sources, and store the data in different databases such as Oracle, Sybase, and MSSQL server, even Microsoft Excel. It becomes crucial that the manager be able to transform the available information into the data that is needed daily and then to be able to easily access the data and maintain data integrity and also continually support updated, accurate and targeted information.

The project focuses on database design and architecture for analyzing fixed-income investments. It includes fixed-income database structure design and the process of data loading, data validation, data sorting and storage.

In this report, fixed-income investments refer to bonds. Of course, when most people think of investing, the first thing that comes to mind is the stock market. After all,

stocks are exciting. The swings in the market are scrutinized in the newspapers and even covered by local evening newscasts. Stories of investors gaining great wealth in the stock market are common.

Bonds, on the other hand, don't have the same sex appeal. The lingo seems arcane and confusing to the average person. Bonds are simply boring, especially during raging bull markets when bonds seem to offer an insignificant return compared to stocks. But the main advantage of bonds is their lack of risk, their relative safety. If you buy bonds from a stable government, your investment is virtually guaranteed. There are three characteristics of a bond that affect its price: maturity, interest rate (often referred to as the coupon), and the presence of embedded options. Depending on the issuers and payment methods, bonds are categorized as *government bonds, municipal bonds, corporate bonds*, and *zero-coupon bonds*. In addition, fixed income securities are classified according to the length of time to maturity. These are the three main categories:

Bills – debt securities maturing in less than one year.

Notes – debt securities maturing in one to ten years.

Bonds – debt securities maturing in more than ten years.

The price fluctuation of bonds is probably their most confusing characteristic. In fact, many new investors are surprised to learn that a bond's price, just like that of any other publicly-traded security, changes on a daily basis. It is true if everybody held them to maturity and was guaranteed to get your principal back, but bond does not have to be held to maturity. At any time a bond can be sold in the open market, where the price can fluctuate, sometimes dramatically. There is one figure that is very important for

measuring return: *yield*. Yield is a figure that shows the return you get on a bond. The simplest version of yield is calculated by the following formula:

$$\text{yield} = \frac{\text{coupon amount}}{\text{price}}.$$

When you buy a bond at par, the yield is equal to the interest rate. When the price changes, so does the yield. Let's demonstrate this with an example. If you buy a bond at its $1000 par value with a 10% coupon the yield is 10% ($100/$1000). But if the price goes down to $800, then the yield goes up to 12.5%. This happens because you are getting the same guaranteed $100 on an asset that is worth $800 ($100/$800). Conversely if the bond goes up in price to $1200 the yield shrinks to 8.33% ($100/$1200). When bond investors refer to yield, they are usually referring to yield to maturity (YTM). YTM is a more advanced yield calculation that shows the total return you will receive if you hold the bond to maturity. For example, if a bond is priced at $900, pays $100 coupon each year for three years and then pays a face value $1000 in the third year, then the yield to maturity is obtained by solving the following equation:

$$900 = \frac{100}{(1+y)} + \frac{100}{(1+y)^2} + \frac{100+1000}{(1+y)^3}$$

Solving the equation gives a yield of $y = 14.3\%$. It equals all the present value of all coupon payments that you will receive (and assumes that you will reinvest the interest payment at the same rate as the current yield on the bond) plus any gain (if you purchased at a discount) or loss (if you purchased at a premium). The yield's relationship with price can be summarized as follows: when price goes up, yield goes down and vice versa.

Technically you'd say the bond's prices and its yield are inversely related. However, the factor that influences a bond more than any other is the level of prevailing interest rates in the economy. When interest rates rise, the prices of bonds in the market fall. This raises the yield of the older bonds and brings them into line with the newer bonds being issued. When interest rates fall, the prices of bonds in the market rise. This lowers the yield of the older bonds and brings them into line with the newer bonds being issued with a lower coupon.

In the next section, we review more of the background on fixed-income securities and bonds in particular. We then describe some of the basics of database architecture as well as the sources of data used by a fund manager. The very next section goes into the details of the database design for the fixed-income fund manager. The final section describes in detail particular reports used by the manager and how the database design generates the reports.

2 Background: Fixed Income Securities

A fixed income security is a financial obligation of an entity that promises to pay a specified sum of money at specified future dates. The *entity* that promises to make the payment is called the *issuer* of the security. Issuers are:

- U.S. government, French government;
- Government-related agencies;
- Municipal government;
- Corporations.

2.1.1 Characteristics

Face Value/Par Value: the amount that the issuer agrees to repay the bondholder by the maturity date.

Coupon (The Interest Rate): the interest rate that the issuer agrees to pay each period. The annual amount of the interest payment made to bondholders during the term of the bond is called the **coupon**.

Maturity: the maturity date of a bond refers to the date that the debt will cease to exist, at which time the issuer will redeem the bond by paying the amount borrowed. For instant: 9% 20-year bond with maturity 12/28/2012.

Bond Rating: a rating for company's credit. Big investment companies, like Lehman Brothers and Moody supply bonds rating systems to help investor distinguish a company's credit risk.

The chart below illustrates the different bond rating scales from the major rating agencies.

Bond Rating		**Grade**	**Risk**
Moody's	***S&P/Fitch***		
Aaa	AAA	Investment	Highest Quality
Aa	AA	Investment	High Quality
A	A	Investment	Strong
Baa	BBB	Investment	Medium Grade
Ba,B	BB,B	Junk	Speculative
Caa/Ca/C	CCC/CC/C	Junk	Highly Speculative
C	D	Junk	In Default

2.1.2 Type of Bonds

Government Bonds: Issued from U.S. Government---known correctively as Treasuries. There are Treasury bonds, Treasury notes, and Treasury bills. T-bills aren't technically bonds because of their short maturity (normally less than one year).

Municipal Bonds: Issued from local governments. They are the next progression in terms of risk. Cities don't go bankrupt that often, but it can happen. The major advantage to "munis" is that the returns are free from federal tax. Local governments also sometime make its debt non-taxable for residents, making some municipal bonds completely tax-free. Because of the tax savings the yield is usually lower than that of a taxable bond. Depending on company or personal situation munis can be a great investment on an after-tax basis.

Corporate Bonds: A company can issue bonds just like it can issue stocks. Large corporations have a lot of flexibility as to how much debt they can issue: the limit is whatever the market will bear. Generally a short-term corporate bond is less than five

years; intermediate is five to twelve years, and long term is over twelve years. Corporate bonds are characterized by higher yields because there is a higher risk of a company defaulting than a government. The upside is they can also be the most rewarding fixed-income investments because of the risk the investors must take on. The company's credit quality is very important: the higher the quality, the lower the interest rate the investor receives.

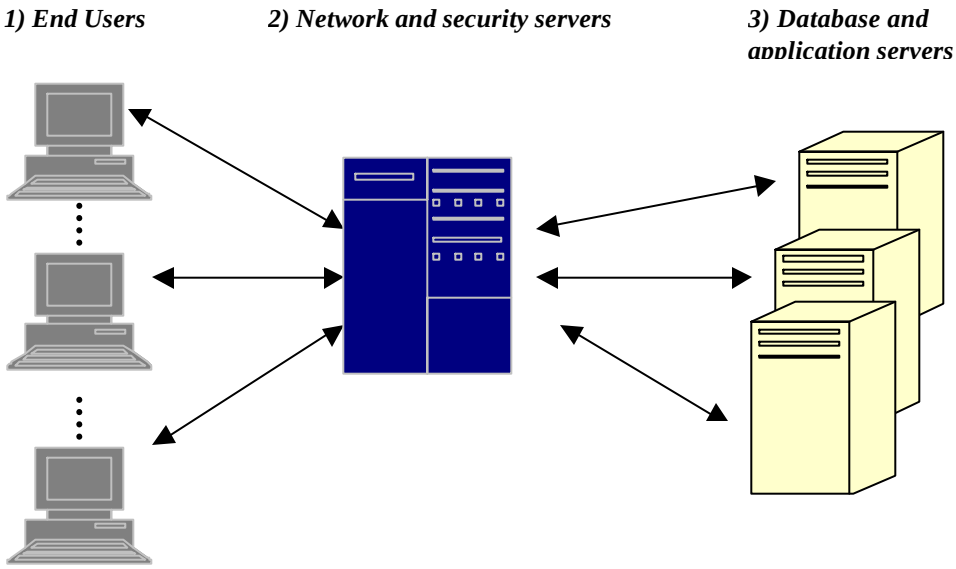
Zero Coupon Bonds: This is a type of bond that makes no coupon payments but instead is issued at a considerable discount to par value. For example, a zero coupon bond with today you pay $600 for a bond that will be worth $1000 in ten years.

Other variations are convertible bonds, which holders can convert to stocks, and callable bonds, which allow the company to redeem an issue prior to maturity.

3 Background: Database Structures

Every business runs on information. Are you storing and accessing information effectively? The following is a short introduction to the benefits of using a relational database for your information.

At its most superficial level, the system is a group of end users (which could be people or specific software applications) with access (through a network) to an organized set of data.



3.1 Relational Database

For small sets of data and simple applications, a database could simply be a spreadsheet. For applications in finance, where large sets of data must be updated daily (or even every few minutes), must be accessible to users and other software applications (like accounting and human resources software), and must run continuous checks to

guarantee the validity and consistency of the data used in decision making, *relational databases* are required.

Database: Think of a database as an electronic version of your filing cabinet—a single place to store, organize, and access all of your information. Databases store information in fields, records, and files. A field is a single piece of information—an issuer's name, for example. A record is one complete set of fields—the issuer's name, issuer's size, and issuer's date. And a file is a collection of records—a complete list of all issuers. To use information contained in a database, you need a Database Management System (DBMS), a collection of software programs that let you to enter, organize, and select information stored in the database.

Relational Database: The most typical DBMS is a Relational Database Management System (RDBMS). An RDBMS stores information in tables of rows and columns. Each column in a database table contains a different type of attribute and each row corresponds to a single record. For example, in a table of country, the columns might include country's code, country's name, and country's alias; each row is a separate country. Your company might use spreadsheets and files to run your business. But it has serious limitations. You will face data access and accuracy problems. Performance, especially during peak demand, can slow to a halt. When your data is saved in various formats on different computers, security and privacy are especially daunting, not to mention backup, recovery, and availability. A relational database is very powerful in all these areas, especially in terms of analysis. Relational database let you manipulate data in complex, interesting ways, allowing you to retrieve all records that match your specific

criteria, cross reference different tables, and update records in bulk. A relational database is especially good for companies that:

1. Have rapidly evolving data need: the volume of data, the type of data and the number of people accessing the data is always changing and growing;
2. Need to generate regular and ad hoc reports based on data for analysis and decision-making, but are not always sure about the data accuracy or integrity;
3. Can't afford downtime or slow performance: users demand non-stop availability and fast performance with multiple back-ups for quick recovery from any failure.

3.2 Logical Structure and Objects

The database has logical structures and physical structures. Because the physical and logical structures are separate, the physical storage of data can be managed without affecting the access to logical storage structures. In this project, I use Oracle database. The logical structures include schema objects, data blocks, extents, segments, and tablespaces.

Schemas and Schema Objects: A **schema** is a collection of database objects. A schema is owned by a database user and has the same name as that user. **Schema objects** are the logical structures that directly refer to the database's data. Schema objects include structures like tables, views, and indices. (There is no relationship between a *tablespace* and a *schema*. Objects in the same schema can be in different tablespaces, and a tablespace can hold objects from different schemas.)

Tables are the basic unit of data storage in an Oracle database. Database tables hold all user-accessible data. Each table has **columns** and **rows.**

Indexes are optional structures associated with tables. Indexes can be created to increase the performance of data retrieval. Just as the index in this manual helps you

quickly locate specific information, an index provides an access path to table data. When processing a request, Oracle can use some or all of the available indexes to locate the requested rows efficiently. Indexes are useful when applications frequently query a table for a range of rows (for example, all portfolio with ID equal to 10) or a specific row. Appendix 1 shows the diagram of tables and relationships.

Integrity constraints are the rules that set up on tables. Every business has its own business rules. Business rules specify conditions and relationships that either must be true, or must be false. You can define integrity constraints to enforce business rules on data in your tables. Because each company defines its own policies about things like security numbers, classification code, and so on, you can specify a different set of rules for each database table. The following is the list of integrity constraint types used in this database design:

- Not Null Integrity Constraints: By default, all columns in a table allow nulls. Null means the absence of a value. A **NOT NULL** constraint requires that a column of a table contain no null values.
- Unique Key Integrity Constraints: A **UNIQUE** key integrity constraint requires that every value in a column or set of columns (key) be unique--that is, no two rows of a table have duplicate values in a specified column or set of columns.
- Primary Key Integrity Constraints: Each table in the database can have at most one **PRIMARY KEY** constraint. The values in the group of one or more columns subject to this constraint constitute the unique identifier of the row. In effect, each row is named by its primary key values. The primary key are also unique and not null.
- Foreign Key Integrity Constraints: The column or set of columns referenced by columns in other tables.

4 Data Sources

In order to help investors understand the different characteristics of bonds and companies that issues them, and how to measure returning from bonds, the information become extremely important and valuable.

SEC: Securities and Exchange Commission provides data service for free, and some investment firms provide different levels service as well. Data can be transported by several formats: export file (special database file, excel format, SQL server data file, etc.), flat file.

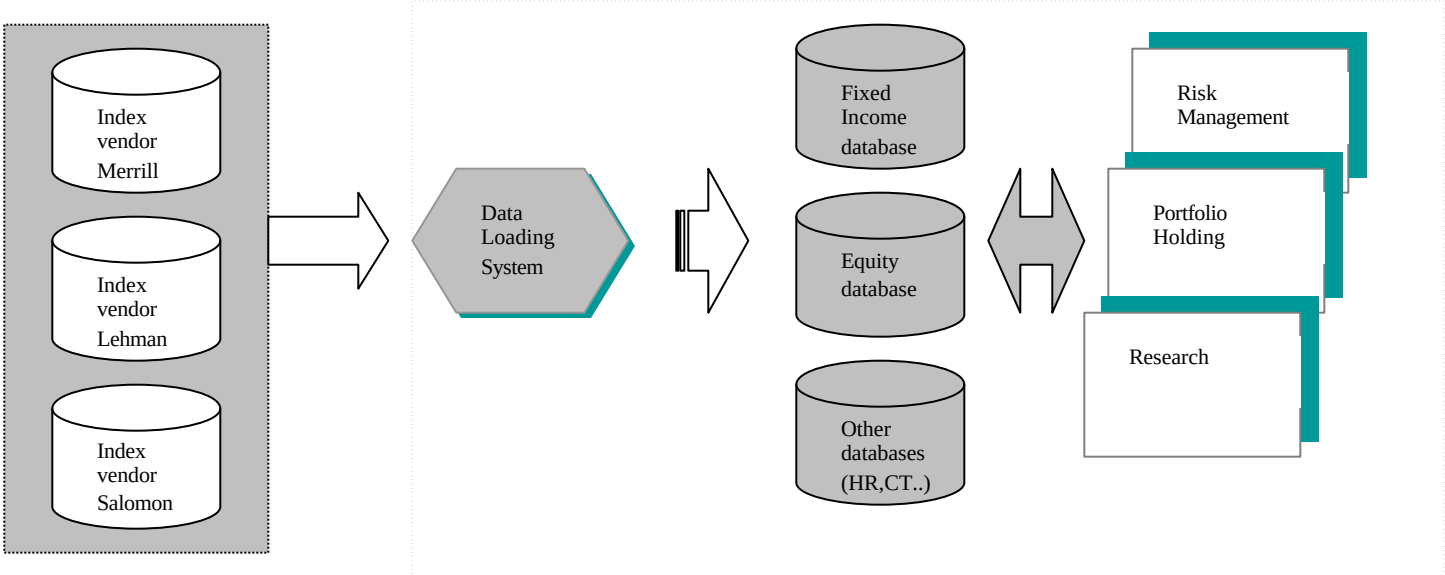
Based on the database server, you can have use different loading tools: database utility tool. Oracle SQL Loader, Microsoft SQL server data import.

5 Database Architecture and Construction

Database Construction included two phases: database design and the process of data loading, data validation, data sorting and storing. Database design involves: identify the entities (things are important), attributes (the properties of the information), and relationships (how they are related to one another), and then convert them into objects such as tables, indexes, and constrains base on the business requirements application.

5.1.1 Infrastructure

Depend on the company's size, the Information Technology department might have a very different infrastructure. In general, assets managing company will need both fixed-income and equity databases. Some of them might adept their accounting, HR system into same server as well. The front end will have risk management application, portfolio management application and research application, etc. The most important will be getting all the indexes data from investment institutes like Merrill, Lehman, Salomon and S&P, so they can analyze and get know their portfolio position.



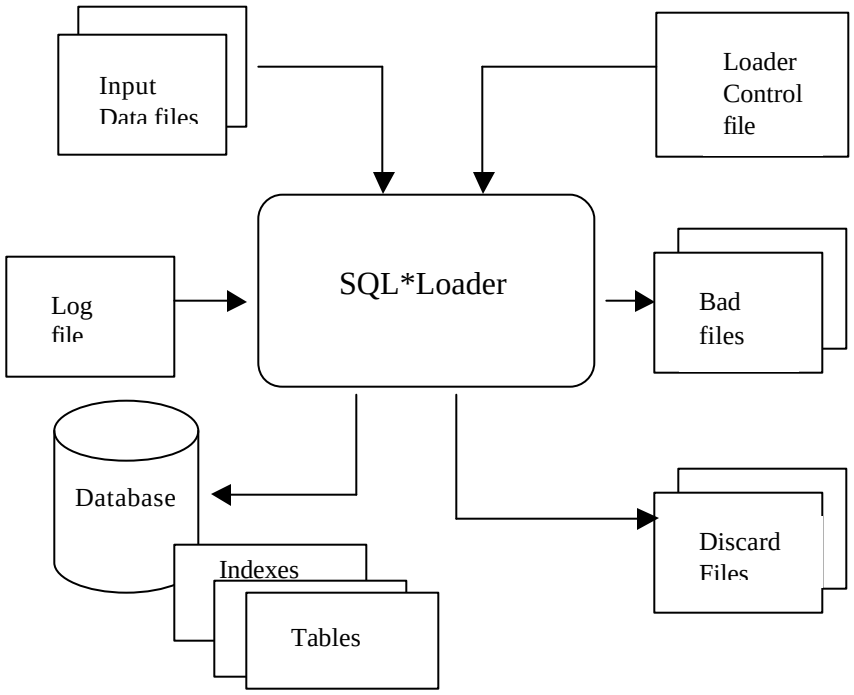
5.1.2 System Architecture

As we already know that database is a collection of data treated as a unit. The purpose of a database is to store and retrieve related information. A database server is the key to solving the problems of information management. In general, a server reliably manages a large amount of data in a multi-user environment so that many users can concurrently access the same data. All this is accomplished while delivering high performance. A database server also prevents unauthorized access and provides efficient solutions for failure recovery.

5.1.3 Data loading system

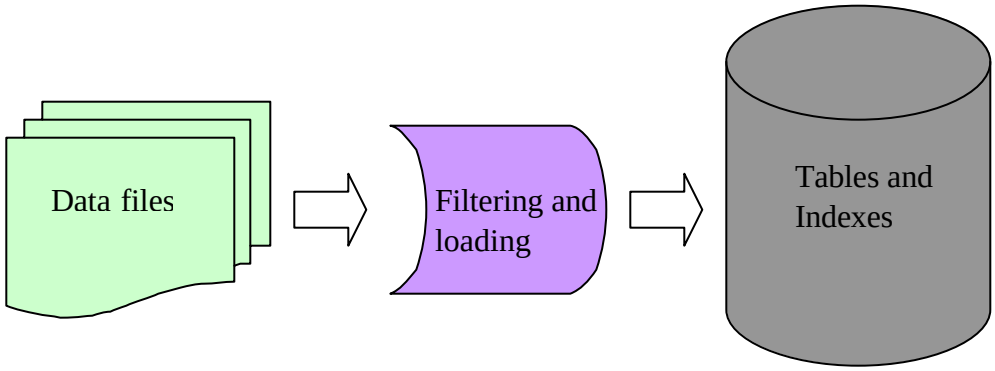
As financial markets trade every day, we need to load data regularly so that it can serve its purpose of facilitating portfolio and risk management analysis. To do this, data from one or more financial institutes needs to be copied into the database. SQL*Loader is used to move data from flat files into an Oracle database. During this data load, SQL*Loader also be used to implement basic data transformations, data manipulation, such as data type conversion and simple NULL handling. Those are automatically resolved during the data load. The following is a simple example of a SQL*Loader controlfile to load data into the globalagg0 table from an external file globalagg0.dat. The external flat file globalagg0.dat security duration and yield spread data. The following shows the control file (globalagg0ctl.ctl) to load the globalagg0 table:

```
LOAD DATA
INFILE 'C:\oracle\oradata\loadingfile\data\globalagg0.dat'
DISCARDFILE 'C:\oracle\oradata\loadingfile\ctl\globalagg0.dsc'
INTO TABLE globalagg0
REPLACE
FIELDS TERMINATED BY ';' OPTIONALLY ENCLOSED BY '"'
 (
 CUSIP          char (10),
 OAD            decimal external,
 OAS            decimal external,
 OAS_TO_WORST   decimal external
)
```



It can be loaded with the following command:

```
$  sqlldr scott/scott control=globalagg0ctl.ctl
```



Data sorting can be done at two levels: table level in which index created whole data loading in a single column or combined columns.

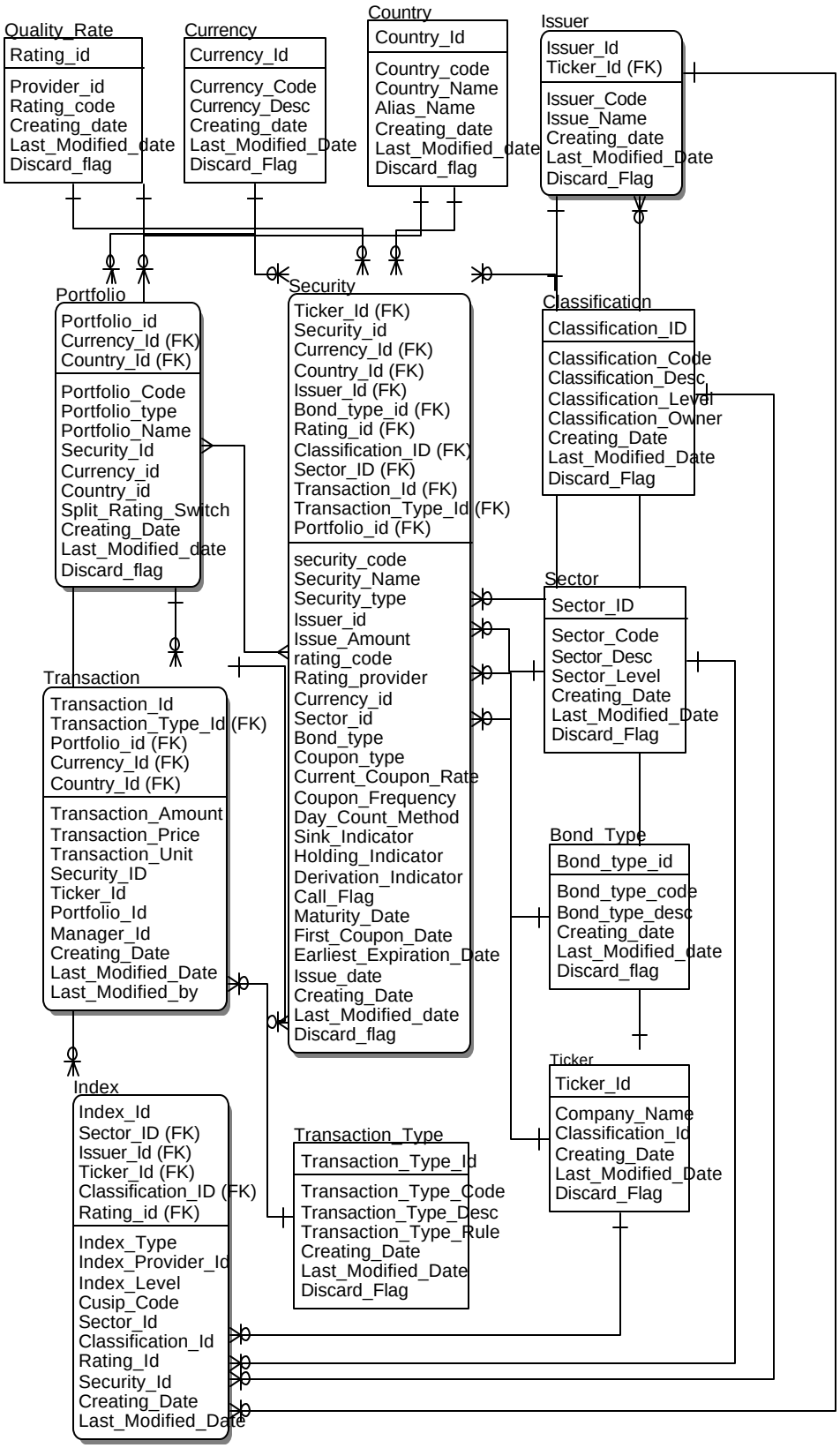
For example: portfolio table is indexed by portfolio ID column, and security table is indexed by security ID column and issuer column.

Data are stored in tables with primary key, multiple foreign keys, and multiple index constraints. Examples like:

The security ID is the primary key for the security table and currency ID is primary key for the currency table, which means their ID columns index both tables and both columns have to be unique. Currency ID is referral as foreign key in security table, which means every currency ID in security table has to be existent in currency table.

5.1.4 Relational Tables

The following table describes, in great detail, the structure of the database that is built through relational tables.


Quality_Rate
Rating_id
Provider_id
Rating_code
Creating_date
Last_Modified_date
Discard_flag
Currency
Currency_Id
Currency_Code
Currency_Desc
Creating_date
Last_Modified_Date
Discard_Flag
Country
Country_Id
Country_code
Country_Name
Alias_Name
Creating_date
Last_Modified_date
Discard_flag
Issuer
Issuer_Id
Ticker_Id (FK)
Issuer_Code
Issue_Name
Creating_date
Last_Modified_Date
Discard_Flag
Portfolio
Portfolio_id
Currency_Id (FK)
Country_Id (FK)
Portfolio_Code
Portfolio_type
Portfolio_Name
Security_Id
Currency_id
Country_id
Split_Rating_Switch
Creating_Date
Last_Modified_date
Discard_flag
Security
Ticker_Id (FK)
Security_id
Currency_Id (FK)
Country_Id (FK)
Issuer_Id (FK)
Bond_type_id (FK)
Rating_id (FK)
Classification_ID (FK)
Sector_ID (FK)
Transaction_Id (FK)
Transaction_Type_Id (FK)
Portfolio_id (FK)
security_code
Security_Name
Security_type
Issuer_id
Issue_Amount
rating_code
Rating_provider
Currency_id
Sector_id
Bond_type
Coupon_type
Current_Coupon_Rate
Coupon_Frequency
Day_Count_Method
Sink_Indicator
Holding_Indicator
Derivation_Indicator
Call_Flag
Maturity_Date
First_Coupon_Date
Earliest_Expiration_Date
Issue_date
Creating_Date
Last_Modified_date
Discard_flag
Classification
Classification_ID
Classification_Code
Classification_Desc
Classification_Level
Classification_Owner
Creating_Date
Last_Modified_Date
Discard_Flag
Sector
Sector_ID
Sector_Code
Sector_Desc
Sector_Level
Creating_Date
Last_Modified_Date
Discard_Flag
Transaction
Transaction_Id
Transaction_Type_Id (FK)
Portfolio_id (FK)
Currency_Id (FK)
Country_Id (FK)
Transaction_Amount
Transaction_Price
Transaction_Unit
Security_ID
Ticker_Id
Portfolio_Id
Manager_Id
Creating_Date
Last_Modified_Date
Last_Modified_by
Bond_Type
Bond_type_id
Bond_type_code
Bond_type_desc
Creating_date
Last_Modified_date
Discard_flag
Ticker
Ticker_Id
Company_Name
Classification_Id
Creating_Date
Last_Modified_Date
Discard_Flag
Index
Index_Id
Sector_ID (FK)
Issuer_Id (FK)
Ticker_Id (FK)
Classification_ID (FK)
Rating_id (FK)
Index_Type
Index_Provider_Id
Index_Level
Cusip_Code
Sector_Id
Classification_Id
Rating_Id
Security_Id
Creating_Date
Last_Modified_Date
Transaction_Type
Transaction_Type_Id
Transaction_Type_Code
Transaction_Type_Desc
Transaction_Type_Rule
Creating_Date
Last_Modified_Date
Discard_Flag

5.1.5 Tables and constraint definition

The data is organized through tables in the database. We now look in detail at the different tables, with the included tables as well as the constraints applied to each columns in the database.

The symbol $\rightarrow\!\!\!\!\!\!\bigcirc$ means "one to many" to indicate that one entry in one table can be referenced many times (so multiple records can have the same value). For example, one record must have only one entry in the country table. One country can have only one record in the country table. On the other hand, in the portfolio or index table, the country table can be reference many times by the country ID.

Table name: SECURITY

Column Name	Null?	Type	
SECURITY_ID	NOT NULL	NUMBER(10)	PK
SECURITY_CODE	NOT NULL	VARCHAR2(10)	
SECURITY_TYPE	NOT NULL	VARCHAR2(10)	
SECURITY_NAME		VARCHAR2(30)	
TICKER_ID	NOT NULL	NUMBER(10)	FK
CURRENCY_ID	NOT NULL	NUMBER(10)	FK
COUNTRY_ID	NOT NULL	NUMBER(10)	FK
ISSUER_ID	NOT NULL	NUMBER(10)	FK
ISSUE_SIZE	NOT NULL	NUMBER(10)	
BOND_TYPE_ID		NUMBER(10)	
RATING_ID	NOT NULL	NUMBER(10)	
RATING_CODE	NOT NULL	VARCHAR2(10)	
RATING_PROVIDER	NOT NULL	VARCHAR2(10)	
CLASSIFICATION_ID	NOT NULL	NUMBER(10)	FK
SECTOR_ID	NOT NULL	NUMBER(10)	FK
TRANSACTION_ID		NUMBER(10)	FK
TRANSACTION_TYPE_ID		NUMBER(10)	
COUPON_TYPE		VARCHAR2(10)	
CURRENT_COUPON_RATE		NUMBER(5,3)	
COUPON_FREQUENCY		NUMBER(3)	
DAY_COUNT_METHOD		VARCHAR2(15)	
SINK_INDICATOR		CHAR(2)	
HOLDING_INDICATOR		CHAR(2)	
DERIVATION_INDICATOR		CHAR(2)	
CALL_FLAG		CHAR(2)	
MATURITY_DATE		NOT NULL DATE	
FIRST_COUPON_DATE		DATE	
EARLIEST_EXPIRATION_DATE		DATE	

ISSUE_DATE		**DATE**
CREATING_DATE	**NOT NULL**	**DATE**
LAST_MODIFIED_DATE	**NOT NULL**	**DATE**
DISCARD_FLAG	**NOT NULL**	**CHAR(2)**

Table Name: CURRENCY

Column Name	**Null?**	**Type**	
----------	**--------**	**----------**	
CURRENCY_ID	**NOT NULL**	**NUMBER(10)**	**PK**
CURRENCY_CODE	**NOT NULL**	**VARCHAR2(10)**	
CURRENCY_DESC	**NOT NULL**	**VARCHAR2(30)**	
CREATING_DATE	**NOT NULL**	**DATE**	
LAST_MODIFIED_DATE	**NOT NULL**	**DATE**	
DISCARD_FLAG	NOT NULL	VARCHAR2(2)	

Table Name: **COUNTRY**

Column Name	Null ?	Data Type	
COUNTRY_ID	NOT NULL	NUMBER(10)	PK
COUNTRY_CODE	NOT NULL	VARCHAR2(10)	
COUNTRY_NAME	NOT NULL	VARCHAR2(30)	
ALIAS_NAME	NOT NULL	VARCHAR2(30)	
CREATE_DATE	NOT NULL	DATE	
LAST_MODIFIED_DATE	NOT NULL	DATE	
DISCARD_FLAG	NOT NULL	VARCHAR2(2)	

Table Name: ISSUER

Column Name	Null?	Data Type	
ISSUER_ID	NOT NULL	NUMBER(10)	PK
TICKER_ID	NOT NULL	NUMBER(10)	FK
ISSUER_CODE	NOT NULL	VARCHAR2(15)	
ISSUER_NAME		VARCHAR2(30)	
CREATE_DATE	NOT NULL	DATE	
LAST_MODIFIED_DATE	NOT NULL	DATE	
DISCARD_FLAG	NOT NULL	CHAR(2)	

Table Name: PORTFOLIO

Column Name	Null?	Data Type	
PORTFOLIO_ID	NOT NULL	NUMBER(10)	PK
CURRENCY_ID	NOT NULL	VARCHAR2(10)	FK
COUNTRY_ID	NOT NULL	NUMBER(10)	FK
PORTFOLIO_CODE		VARCHAR2(10)	
PORTFOLIO_TYPE		VARCHAR2(10)	
PORTFOLIO_NAME		VARCHAR2(10)	
SECURITY_ID	NOT NULL	NUMBER(10)	FK
SPLIT_RATING_SWITCH		VARCHAR2(10)	
CREATING_DATE	NOT NULL	DATE	
LAST_MODIFIED_DATE	NOT NULL	DATE	
DISCARD_FLAG	NOT NULL	CHAR(2)	
SECURITY_SIZE	NOT NULL	NUMBER(10)	

Table Name: CLASSIFICATION

Column Name	Null?	Type	
CLASSIFICATION_ID	NOT NULL	NUMBER(10)	PK
CLASSIFICATION_CODE	NOT NULL	VARCHAR2(10)	
CLASSIFICATION_DESC	NOT NULL	VARCHAR2(100)	
CLASSIFICATION_LEVEL		CHAR(2)	
CLASSIFICATION_OWNER		VARCHAR2(30)	
CREATING_DATE	NOT NULL	DATE	
LAST_MODIFIED_DATE	NOT NULL	DATE	
DISCARD_FLAG	NOT NULL	CHAR(2)	

Table Name: QUALITY RATING

ColumnName	Null?	Type	
RATING_ID	NOT NULL	NUMBER(10)	PK
RATING_CODE	NOT NULL	VARCHAR2(10)	
RATING_PROVIDER	NOT NULL	VARCHAR2(30)	
CREATING_DATE	NOT NULL	DATE	
LAST_MODIFIED_DATE	NOT NULL	DATE	
DISCARD_FLAG	NOT NULL	CHAR(2)	

Table Name: SECTOR

Column Name	Null?	Type	
SECTOR_ID	NOT NULL	NUMBER(10)	PK
SECTOR_CODE	NOT NULL	VARCHAR2(100)	
SECTOR_LEVEL		CHAR(2)	
CREATING_DATE	NOT NULL	DATE	
LAST_MODIFIED_DATE	NOT NULL	DATE	
DISCARD_FLAG	NOT NULL	VARCHAR2(2)	

Table Name: TICKER

Column Name	Null?	Type	
TICKER_ID	NOT NULL	NUMBER(10)	PK U1
COMPANY_NAME	NOT NULL	VARCHAR2(30)	FK
CLASSIFICATION_CODE	NOT NULL	VARCHAR2(10)	U2
CREATING_DATE	NOT NULL	DATE	
LAST_MODIFIED_DATE	NOT NULL	DATE	
DISCARD_FLAG	NOT NULL	CHAR(2)	
TICKER_CODE	NOT NULL	VARCHAR2(10)	

Table Name: TRANSACTION

Column Name	Null?	Type
TRANSACTION_ID	NOT NULL	NUMBER(10)
TRANSACTION_TYPE	NOT NULL	VARCHAR2(10)
PORTFOLIO_ID	NOT NULL	NUMBER(10)
CURRENCY_ID	NOT NULL	NUMBER(10)
COUNTRY_ID	NOT NULL	NUMBER(10)
TRANSACTION_AMOUNT	NOT NULL	NUMBER(10)
TRANSACTION_UNIT	NOT NULL	NUMBER(10)
SECURITY_ID	NOT NULL	NUMBER(10)
TICKER_ID	NOT NULL	NUMBER(10)
MANAGER_ID		NUMBER(10)
CREATING_DATE	NOT NULL	DATE
LAST_MODIFIED_DATE	NOT NULL	DATE
LAST_MODIFIED_BY	NOT NULL	VARCHAR2(30)
PRICE		NUMBER(6,3)

6 Examples

We now describe two examples of how a manager would actually use the fixed income database.

6.1 Duration Report

Fixed income portfolio managers at investment companies monitor the interest rate risk very closely and the value of a bond changes in the opposite direction of the change in interest rate. They want to know what are the positions of their portfolios and how sensitive of their portfolio reflected regarding of interest rate changes. Duration is the one of two approaches to measuring interest rate risk. The calculation is done as follows:

$$Duration = \frac{V_{-} - V_{+}}{2 \cdot V_0 \cdot \Delta y}$$

where

- Δy is the change in yield (in decimal form)
- V_0 is the initial price;
- V_{-} is the bond price if yield declines by Δy;
- V_{+} is the bond price if the yield increases by Δy.

Duration defined as a measure of the approximate sensitivity of a bond's value to rate changes. Here is an example, a 9% coupon 20-year option-free bond selling at 134.6722 to yield 6%. If we change the yield down and up by 20 basis points, which mean that yield is decreased from 6.0 to 5.8 and the price would increase to 137.588 or increased from 6.0 to 6.2 and price would decrease to 131.8439. Then the duration will be:

$$Duration = \frac{137.588 - 131.8439}{2(134.6722)(0.0002)} = 10.66$$

After you calculate the duration you can approximate the percentage price change by: duration * Δy * 100. Calculating of the duration for optional securities are very complex and that is why most investors and asset companies get them from suppliers like Fetch, Moody or Bloomberg. But what my calculation is for portfolios and sectors level. The format is as below:

$$\text{Duration of the portfolio} = W_1 \cdot D_1 + W_2 \cdot D_2 + \cdots + W_n \cdot D_n$$

Where W_i is the weight of a security i, D_i is the duration for security i, and n is the number of securities in the portfolio.

Above duration is called modified duration, which means using same cash flows to calculate V_0. It is the approximate percentage change in bond's price for a 100 basis points change in yield assuming that the bond's expected cash flows do not change when the yield changes. But when we value a bond with embedded options, for example callable option, the expected cash flows will affect the expected cash flows. When duration is calculated this manner, it is referred to as option –adjusted duration.

6.2 Portfolio and Sector Level Duration Reports

Everyday a portfolio manager may want to see a report of measuring the interest rate exposure to different basis point change in interest rates. There are two approaches to measure the interest risk – the full valuation approach and the duration approach. Portfolio level duration will give managers an idea of how a portfolio will change and

sector level duration will shows managers how each sector affected if rates change in parallel fashion. Here is how the system works:

1. Load data from four data files: globalagg00.dat, globalagg11.dat, globalagg22.dat and globalagg33.dat into temporary tables (in scheme Scott): GLOBALAGG0, GLOBALAGG1, GLOBALAGG2 and GLOBALAGG3. This loading process needs to be done everyday with time stamp and tables are refreshed every day. The following is a one loading script used for globalagg22 file:

SQL Loader command like ‘sqlldr control = globalagg1 errors =2000 userid= scott/scott
Control file example:

```
LOAD DATA
INFILE 'C:\oracle\oradata\loadingfile\data\globalagg22.dat'
DISCARDFILE 'C:\oracle\oradata\loadingfile\ctl\globalagg2.dsc'
INTO TABLE globalagg2
REPLACE

FIELDS TERMINATED BY ';' OPTIONALLY ENCLOSED BY '"'
 (cusip                          char,
AMOUNT_OUTSTANDING               decimal external,
AMT_OUTSTANDING_NATIVE           decimal external,
COUPON                           decimal external,
COUPON_FREQ                      decimal external,
COUPON_ORIGINAL                  decimal external,
DAY_COUNT                        char,
FLOAT_COUPON_TYPE                char,
GUARANTEE_TYPE                   char,
ISSUE_DATE                       char,
ISSUE_SIZE                       decimal external,
MATURITY_DATE                    char,
PLACEMENT_TYPE                   char,
SECURITY_STATUS                  char,
SECURITY_TYPE                    char,
SUBORD_TYPE                      char,
CAPITAL_SECURITY_TYPE            char,
MARKET_VALUE                     decimal external,
ACCRUED_INTEREST                 decimal external,
PRICE                            decimal external,
MOD_DUR_TO_WORST                 decimal external
)
```

2. Trig the process programs to distribute data into tables, which is table INDEX, and update or added more rows into table COUNTRY, CURRENCY, INDEX, ISSUER, BOND_TYPE, CLASSIFICATION, and QUALITY_RATING in scheme PORTFOLIO.

3. After data has been populated into tables, you can use any program language to access data in the database. For example, using following Oracle interactive language SQL to give you a duration at portfolio and sector level from database directly:

```
Select  p.portfolio_id,
   s.security_code,
   sum(d.oad),
   sum(d.oas)
from portfolio f,security s,security_duration d
group by p.portfolio_id, s.security_code
where   p.security_id=s.security_id
  and   s.scurity_code=d.security_code.

        Select    p.portfolio_id,
s.sector_id,
sum(d.OPTION_ADJUSTED_DURITION),
sum(d.OPTION_ADJUSTED_SPREAD)
  from  portfolio p,
security s,
security_durition d
         where    p.security_id=s.security_id
   and  s.security_code=d.security_code
   and  s.HOLDING_INDICATOR ='Y'
   group by  p.portfolio_id,s.sector_id
```

Here is how tables linked together for portfolio level:

Table: Portfolio

PORTFOLIO_ID	SECURITY_ID	SECURITY_SIZE	CURRENCY_ID	COUNTRY_ID
1	1011	1013	12607	24
1	1012	1694	12596	52

Table: Security

SECURITY_ID	SECURITY_CODE	ISSUER_ID	ISSUE_SIZE	MATURITY_DATE
1011	136385AE	11376	450537	6/30/2033
1012	JPY02915	10141	1800085	7/27/2006

Table: security duration

SECURITY_CODE	OAD	OAS	OAS (to Worst)	POSTING_DATE
136385AE	13.67040634	102.4076004	1.024075985	1/3/2005
JPY02915	1.559530973	11.76080036	0.117608003	1/3/2005

Table: Portfolio

PORTFOLIO_ID	SECURITY_ID	SECURITY_SIZE	CURRENCY_ID	COUNTRY_ID
1	1011	1013	12607	24
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Table: Security

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Table: security duration

SECURITY_CODE	OAD	OAS	OAS (to Worst)	POSTING_DATE
136385AE	13.67040634	102.4076004	1.024075985	1/3/2005
JPY02915	1.559530973	11.76080036	0.117608003	1/3/2005

The result for portfolio will be:

PORTFOLIO_ID	SUM (OAD)	SUM (OAS)
1	15.22993731	114.1684008

The sum of durations for the portfolio is 15.23 (in units of percent change per hundred basis points) and the total option adjusted spread for the portfolio is 114.17 (in the same units).

The result for sector will be:

PORTFOLIO_ID	SECTOR_ID	SUM(OAD)	SUM(OAS)
1	2	4.3155179	274.056091
1	5	27.6733245	35.4906991
1	7	69.3819886	680.360398
1	8	53.8802811	685.5553
1	9	13.2405573	88.8593979
1	16	2.88462901	18.5102005
1	17	2.56682801	28.8876
1	19	55.0988938	589.559299
1	20	8.14789271	83.979599
1	21	18.8805933	94.5929985
1	23	1.75151895	184.564903
1	25	95.505438	1189.145
1	27	1.48704696	13.2746992
1	28	38.9116117	96.0260978
1	29	7.79067612	14.5531998
1	30	134.531082	1513.75089
1	32	8.96861792	228.158394
1	34	11.392812	37.0955992
1	35	3.10619307	13.2862005
1	36	15.3710361	172.511196
1	37	28.2803849	294.582701

As you can see, by a few query statements, you can easily write some reports like the example. In this last table, for example, the manager knows that the total duration for sector 7 (European investment bank issued bonds) with a value of 69.38 is the largest

contributor to the portfolio. The option adjusted spread is also large for this sector, but it is not the largest for the portfolio. The largest option adjusted spread occurs in sector 30 (non-US treasury bonds).

7 Summary

The focus of this project was on database design for fixed-income analysis. The main part of the work was the actual construction of the database using real data obtained from industry sources. The architecture was tested in loading the data, in validating the data, and in generating reports that would be useful to the portfolio manager.

A good portfolio management means combination of good analysis and information technology. Effective database structure is the foundation for reaching your business goal.

References

[1] Elton, E.J., M.J. Gruber, S.J. Brown, W.N. Goetzmann (2003), *Modern Portfolio Theory and Investment Analysis (Sixth Edition)*, John Wiley & Sons, New York

[2] Faboozzi, F.J. and T.D. Faboozzi (1995), The Handbook of Fixed Income Securities (Fourth Edition), Irwin Professional Publishing, Chicago, Illinois.

[3] Oracle 9i Database Administration, Published by Oracle Corp.

[4] Len Boss. From Carnegie Mellon, *Attribute Driven Design Method.*

[5] Keith Siilats, portfolio manager at Lehman Brothers. *Fixed Income Money management with $1bn+ size.*

Appendix A Table list and description

Table Name	Table Type	Description
BOND_TYPE	Reference	Define all types for bond
CLASSIFICATION	Reference	Define all Classifications with different providers for Securities.
COUNTRY	Reference	Define all Countries and Alisa.
CURRENCY	Reference	Define all Currencies
FIX_INDEX	Function	Store all Indexes from different providers.
ISSUER	Reference	Define all Issuers information
PORTFOLIO	Function	Define all Portfolios with all Securities. (Portfolio_id + Security_id is unique)
QUALITY_RATING	Reference	Store all Indexes from different providers.
SECTOR	Reference	Define all Sectors for Issuers
SECURITY	Function	Define all Securities that happened within Company.
SECURITY_DURITION	Reference	Define the OAD, OAS (spread) for each individual Security
TICKER	Reference	All Tickers information
TRANSACTION	Function	Every Transaction happened included coupon payment within company.

Appendix B Data File Examples

File No.0:

Cusip	OAD	OAS	OAS (To Worst)
00077QAC	2.924607038	8.00E-02	8.00E-04
00077QAD	1.408468962	43.05699921	0.430570006
007924AD	1.484900951	45.84609985	0.458460987
008117AC	1.494832993	60.50069809	0.605006993
008117AH	11.46871758	110.6189957	1.106189966
008117AJ	13.48484039	123.2404938	1.232404947
008281AL	7.915558815	49.59130096	0.495912999
020039AE	8.018610954	83.24850464	0.83248502
029163AD	11.52944946	163.1448975	1.631448984
035229AL	4.086304188	47.42720032	0.474272013

File No.1:

Cusip	Description	Identifier	Identifier Type	ISIN
00077QAC	ABN-AMRO BANK NV	00077QAC	Cusip	US00077QAC42
00077QAD	ABN-AMRO BANK NV - GLOBAL	00077QAD	Cusip	US00077QAD25
007924AD	AEGON NV	007924AD	Cusip	US007924AD52
008117AC	AETNA INC/LION CONN HLDS	008117AC	Cusip	US008117AC74
008117AH	AETNA INC/LION CONN HLDS	008117AH	Cusip	US008117AH61
008117AJ	AETNA INC/LION CONN HLDS	008117AJ	Cusip	US008117AJ28
008281AL	AFRICAN DEVELOPMENT BANK	008281AL	Cusip	US008281AL16
020039AE	ALLTEL CORPORATION	020039AE	Cusip	US020039AE31
029163AD	AMERICAN RE CORP	029163AD	Cusip	US029163AD49
035229AL	ANHEUSER-BUSCH CO INC	035229AL	Cusip	US035229AL71

Issuer Name	Ticker	Classification - Detail	Classification - Detail-Code
ABN AMRO BANK NV/CHICAGO	AAB	BANKING	BAA
ABN AMRO BANK NV/CHICAGO	AAB	BANKING	BAA
AEGON NV	AEGON	LIFE	BAGA
LION CONNECTICUT HOLDINGS INC	INTNED	LIFE	BAGA
LION CONNECTICUT HOLDINGS INC	INTNED	LIFE	BAGA
AETNA INC/OLD	INTNED	LIFE	BAGA
AFRICAN DEVELOPMENT BANK	AFDB	SUPRANATIONALS	BDC
ALLTEL CORP	AT	WIRELINES	BBHD
AMERICAN RE CORP	MUNRE	P&C	BAGB
ANHEUSER-BUSCH COS INC	BUD	FOOD_AND_BEVERAGE	BBDI

Issuer Classification Code	Country	Instr Type	Sector	Currency	Currency Original	D&P Rating	S&P Rating	Moody Rating
CCA	Netherlands	bond	Finance	USD	USD	NR	A+	A1
CCA	Netherlands	bond	Finance	USD	USD	NR	A+	A1
CCDA	Netherlands	bond	Finance	USD	USD	NR	A	A3
CCDA	United States	bond	Finance	USD	USD	NR	A+	AA3
CCDA	United States	bond	Finance	USD	USD	NR	A+	AA3
CCDA	United States	bond	Finance	USD	USD	NR	A+	AA3
BD	Supranational	bond	SUPRA-National	USD	USD	NR	AA+	AA1
CAHC	United States	bond	Industrial	USD	USD	NR	A	A2
CCDB	United States	bond	Finance	USD	USD	NR	BBB	A3
CADH	United States	bond	Industrial	USD	USD	NR	A+	A1

File No.2

Cusip	Amount Outstanding	Amt Outstanding (Native)	Coupon	Coupon Freq	Coupon Original
00077QAC	514899.9164	400000	7.3	2	7.300000191
00077QAD	965437.3433	750000	7.55	2	7.550000191
007924AD	514899.9164	400000	8	2	8
008117AC	450537.4269	350000	7.125	2	7.125
008117AH	579262.406	450000	7.625	2	7.625
008117AJ	386174.9373	300000	6.97	2	6.96999979
008281AL	514899.9164	400000	6.875	2	6.875
020039AE	386174.9373	300000	7	2	7
029163AD	643624.8955	500000	7.45	2	7.449999809
035229AL	450537.4269	350000	9	2	9

Currency	Day Count	Float Cpn Type	Guarantee Type	Issue Date	Issue Size	Maturity Date	Placement Type
USD	30/360	NONFLOT	PRIVATE	11/26/1996	514899.9164	12/1/2026	SEC
USD	30/360	NONFLOT	PRIVATE	6/18/1996	965437.3433	6/28/2006	SEC
USD	30/360	NONFLOT	NONGUAR	8/15/1994	514899.9164	8/15/2006	SEC
USD	30/360	NONFLOT	NONGUAR	8/14/1996	450537.4269	8/15/2006	SEC
USD	30/360	NONFLOT	NONGUAR	8/14/1996	579262.406	8/15/2026	SEC
USD	30/360	NONFLOT	NONGUAR	8/14/1996	386174.9373	8/15/2036	SEC
USD	30/360	NONFLOT	NONGUAR	10/16/1995	514899.9164	10/15/2015	SEC
USD	30/360	NONFLOT	NONGUAR	3/5/1996	386174.9373	3/15/2016	SEC
USD	30/360	NONFLOT	NONGUAR	12/24/1996	643624.8955	12/15/2026	SEC
USD	30/360	NONFLOT	NONGUAR	12/6/1989	450537.4269	12/1/2009	SEC

Security Status	Security Type	Subord Type	Capital Security Type	Market Value	Accrued Interest	Price	Mod Dur to Worst
CONTIN	CAPSEC	LT2	CALLABLE	555002.2	0.669167	107.1192	1.778904
CONTIN	GLOBAL	LT2	BULLET	1024501	0.125833	105.992	1.407378
CONTIN	REGULAR	SUBDEB	BULLET	567296.8	3.088889	107.0872	1.481111
CONTIN	REGULAR	NOTES	BULLET	487636.5	2.751042	105.4834	1.489924
CONTIN	REGULAR	DEBNTRS	BULLET	712121	2.944097	119.9917	11.20395
CONTIN	REGULAR	DEBNTRS	CALLABLE	448963.3	2.691194	113.5679	13.40898
CONTIN	REGULAR	SUBDEB	BULLET	608495.9	1.508681	116.6688	7.747943
CONTIN	REGULAR	DEBNTRS	CALLABLE	451053.2	2.119444	114.6808	7.833019
CONTIN	REGULAR	SRNOTES	CALLABLE	717394.2	0.393194	111.0683	11.25725
CONTIN	REGULAR	DEBNTRS	BULLET	552105.5	0.825	121.7188	4.054803

File No.3

Cusip	Index Flag (Agg)	Index Flag (Asia Pac)	Index Flag (CMBS)	Index Flag (CMBS Hi Yld)	Index Flag (Danish MBS)	Index Flag (Emerging Markets)	Index Flag (Euro Agg)	Index Flag (Eurobond)	Index Flag (Euro HiYld)
00077QAC	BOTH_IND	NOT_IND	NOT_IND	NOT_IND	NOT_IND	NOT_IND	NOT_IND	NOT_IND	NOT_IN
00077QAD	BOTH_IND	NOT_IND	NOT_IND	NOT_IND	NOT_IND	NOT_IND	NOT_IND	BOTH_IND	NOT_IN
007924AD	BOTH_IND	NOT_IND	NOT_IND	NOT_IND	NOT_IND	NOT_IND	NOT_IND	NOT_IND	NOT_IN
008117AC	BOTH_IND	NOT_IND	NOT_IND	NOT_IND	NOT_IND	NOT_IND	NOT_IND	NOT_IND	NOT_IN
008117AH	BOTH_IND	NOT_IND	NOT_IND	NOT_IND	NOT_IND	NOT_IND	NOT_IND	NOT_IND	NOT_IN
008117AJ	BOTH_IND	NOT_IND	NOT_IND	NOT_IND	NOT_IND	NOT_IND	NOT_IND	NOT_IND	NOT_IN
008281AL	BOTH_IND	NOT_IND	NOT_IND	NOT_IND	NOT_IND	NOT_IND	NOT_IND	NOT_IND	NOT_IN
020039AE	BOTH_IND	NOT_IND	NOT_IND	NOT_IND	NOT_IND	NOT_IND	NOT_IND	NOT_IND	NOT_IN
029163AD	BOTH_IND	NOT_IND	NOT_IND	NOT_IND	NOT_IND	NOT_IND	NOT_IND	NOT_IND	NOT_IN
035229AL	BOTH_IND	NOT_IND	NOT_IND	NOT_IND	NOT_IND	NOT_IND	NOT_IND	NOT_IND	NOT_IN

Index Flag (Euro Yen)	Index Flag (Global Tsy)	Index Flag (HiYld)	Index Flag (Pan Euro)	Index Flag (144A)	Index Flag (EuroEmg)	Index Flag (Capsec)	Index Flag (Reals)	Index Flag Exception	Index Flag GlobalAgg	Index Flag FF
NOT_IND	NOT_IND	NOT_IND	NOT_IND	NOT_IND	NOT_IND	BOTH_IND	NOT_IND	REGULAR	BOTH_IND	NOT_IN
NOT_IND	NOT_IND	NOT_IND	NOT_IND	NOT_IND	NOT_IND	BOTH_IND	NOT_IND	REGULAR	BOTH_IND	NOT_IN
NOT_IND	NOT_IND	NOT_IND	NOT_IND	NOT_IND	NOT_IND	NOT_IND	NOT_IND	REGULAR	BOTH_IND	NOT_IN
NOT_IND	NOT_IND	NOT_IND	NOT_IND	NOT_IND	NOT_IND	NOT_IND	NOT_IND	REGULAR	BOTH_IND	NOT_IN
NOT_IND	NOT_IND	NOT_IND	NOT_IND	NOT_IND	NOT_IND	NOT_IND	NOT_IND	REGULAR	BOTH_IND	NOT_IN
NOT_IND	NOT_IND	NOT_IND	NOT_IND	NOT_IND	NOT_IND	NOT_IND	NOT_IND	REGULAR	BOTH_IND	NOT_IN
NOT_IND	NOT_IND	NOT_IND	NOT_IND	NOT_IND	NOT_IND	NOT_IND	NOT_IND	REGULAR	BOTH_IND	NOT_IN
NOT_IND	NOT_IND	NOT_IND	NOT_IND	NOT_IND	NOT_IND	NOT_IND	NOT_IND	REGULAR	BOTH_IND	NOT_IN
NOT_IND	NOT_IND	NOT_IND	NOT_IND	NOT_IND	NOT_IND	NOT_IND	NOT_IND	REGULAR	BOTH_IND	NOT_IN
NOT_IND	NOT_IND	NOT_IND	NOT_IND	NOT_IND	NOT_IND	NOT_IND	NOT_IND	REGULAR	BOTH_IND	NOT_IN

Appendix C Column Definition

'able Name	Column Name	Description
ortfolio	PORTFOLIO_ID	The sequence number that uniqely identify the row
	CURRENCY_ID	Same Id in the currency table
	COUNTRY_ID	Same Id in the contry table
	PORTFOLIO_CODE	The special code to indication the portfolio
	PORTFOLIO_TYPE	The portfolio type code
	PORTFOLIO_NAME	The name description for a portfolio
	SECURITY_ID	same ID in for a security
	SPLIT_RATING_SWITCH	different rating indication for a security
	CREATING_DATE	
	LAST_MODIFIED_DATE	
	DISCARD_FLAG	
	SECURITY_SIZE	the amount for the security
ecurity	SECURITY_ID	The sequence number uniqely identify the security
	SECURITY_CODE	Usually the cusip code
	SECURITY_TYPE	The security type code
	SECURITY_NAME	security name description
	TICKER_ID	same id defined in ticker table
	CURRENCY_ID	
	COUNTRY_ID	
	ISSUER_ID	same id defined in issuer table
	ISSUE_SIZE	Par amount raised when issued
	BOND_TYPE_ID	same id defined in bond_type table
	CLASSIFICATION_CODE	Bond classification by industry
	SECTOR_ID	same id defined in sector table
	TRANSACTION_ID	same id defined in transaction table
	TRANSACTION_TYPE	cash flow type the value can be cash, buy, sell, coupon payment.etc
	COUPON_TYPE	coupon payment type
	CURRENT_COUPON_RATE	the coupon rate that currently paying
	COUPON_FREQUENCY	frequency payment
	DAY_COUNT_METHOD	day count method
	SINK_INDICATOR	sinking fund provision (amortizing feature: partial principan repayments)
	HOLDING_INDICATOR	whether still hold the security
	DERIVATION_INDICATOR	whether the security is derivative.
	CALL_FLAG	call option
	MATURITY_DATE	maturity date
	FIRST_COUPON_DATE	the first date that coupon payment
	EARLIEST_EXPIRATION_DATE	the earliest call option date
	ISSUE_DATE	the security issured date

	CREATING_DATE	
	LAST_MODIFIED_DATE	
	DISCARD_FLAG	
ector	SECTOR_ID	The sequence number uniqely identify the sector
	SECTOR_CODE	the sample code for sector (INT for international, UST for US Treasury)
	SECTOR_LEVEL	sector level (UST is level and UST bill for level 2)
	CREATING_DATE	
	LAST_MODIFIED_DATE	
	DISCARD_FLAG	
ond_type	BOND_TYPE_ID	The sequence number uniqely identify the bond type
	BOND_TYPE_CODE	the sample code for bond type value can be:
	CREATING_DATE	
	LAST_MODIFIED_DATE	
	DISCARD_FLAG	
lassification	CLASSIFICATION_ID	The sequence number uniqely identify the classification
	CLASSIFICATION_CODE	the classification code like government, finacial institutions, etc
	CLASSIFICATION_DESC	full description for the class
	CLASSIFICATION_LEVEL	same as sector.
	CLASSIFICATION_OWNER	supplier like Merril Linch
	CREATING_DATE	
	LAST_MODIFIED_DATE	
	DISCARD_FLAG	
ountry	COUNTRY_ID	The sequence number uniqely identify the country
	COUNTRY_CODE	sample code for country for example CN for China
	COUNTRY_NAME	Full name of a country
	ALIAS_NAME	alias name for the country(for most of them are same as name)
	CREATE_DATE	
	LAST_MODIFIED_DATE	
	DISCARD_FLAG	
urrency	CURRENCY_ID	The sequence number uniqely identify the currency
	CURRENCY_CODE	sample code for a currency lke JPY for Janpanes Yuan
	CURRENCY_DESC	Full description for a currency
	CREATING_DATE	

	LAST_MODIFIED_DATE	
	DISCARD_FLAG	
IX_Index	INDEX_ID	The sequence number uniqely identify the index
	SECTOR_ID	
	ISSUER_ID	
	TICKER_ID	
	CLASSIFICATION_ID	
	RATING_ID	
	INDEX_TYPE	
	INDEX_PROVIDER_ID	
	SECURITY_ID	
	CUSIP	
	CREATING_DATE	
	LAST_MODIFIED_DATE	
	DISCARD_FLAG	
ssuer	ISSUER_ID	
	TICKER_ID	
	ISSUER_CODE	
	ISSUER_NAME	
	CREATE_DATE	
	LAST_MODIFIED_DATE	
	DISCARD_FLAG	
UALITY_RATING	RATING_ID	
	RATING_CODE	The sequence number uniqely identify the rating
	RATING_PROVIDER	Quality rating code like AAA , BB
	CREATING_DATE	institutions name that provide the rating
	LAST_MODIFIED_DATE	
	DISCARD_FLAG	
ECURITY_DURITION	SECURITY_CODE	
	OPTION_ADJUSTED_DURITION	usually the cusip code
	OPTION_ADJUSTED_SPREAD	OAD
	OPTION_ADJUSTED_SPREAD_WORST	OAS
	POSTING_DATE	
	CREATE_DATE	
	LAST_MODIFIED_DAY	
	DISCARD_FLAG	
ICKER	TICKER_ID	
	COMPANY_NAME	
	CLASSIFICATION_CODE	
	CREATING_DATE	
	LAST_MODIFIED_DATE	

	DISCARD_FLAG	
	TICKER_CODE	the sample code for ticker , ELI for Elly Lilly & Company
RANSACTION	TRANSACTION_ID	
	TRANSACTION_TYPE	
	PORTFOLIO_ID	
	CURRENCY_ID	
	COUNTRY_ID	
	TRANSACTION_AMOUNT	
	TRANSACTION_UNIT	
	SECURITY_ID	
	TICKER_ID	
	MANAGER_ID	
	CREATING_DATE	
	LAST_MODIFIED_DATE	
	LAST_MODIFIED_BY	
	PRICE	

Bond type code

NOCOLLT	No Collateral
1stLIEN	Real Estate 1st Lien
2ndLIEN	Real Estate 2nd Lien
HILIEN	Real Estate 3rd& Higher Liens
LAND	Land/Railroad Tracks
FLORPLN	Floor plan Receivables
CARLOAD	Car Loads Receivables