IMPORTS AND EXPORTS OF THE USA

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DEDICATION

I would also like to take this opportunity to thank my Husband, Kalyan (Brother-in-law) for their constant moral support and standing by me for accomplishing my work. I would also like to dedicate this thesis to my professor Dr. Carl Eckberg.

Last but not least, I would like to thank my parents for their constant motivation in helping me succeed in life.
ABSTRACT OF THE THESIS

Imports and Exports of the USA
by
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This project concentrates on developing a GIS tool for displaying the imports & exports of the United States. The tool is built in an interactive environment, thus stimulating the interest of students when presented in a classroom environment. Users have the ability to choose from the top 10 imports and exports categories (based on USD for 10 years). When a particular category is selected, the tool highlights the top 10 countries (by USD) for that particular category. By leveraging technology in conjunction with Economics subjects, this not only makes the environment interactive but also presents the subject in an engaging and lively fashion.

In addition, the thesis examines how goods are delivered from exporters to importers. Product can be shipped by truck, train, and if liquid, by pipe, if land routes exist. But much has to be sent on ocean worthy ships, like bulk carriers and tankers. The thesis also pays homage to major data sources, and shows how to use them effectively.

The application uses throughout the project, the Map Object Java Edition (MOJO) API provided by ESRI. A key UI challenge of any Learning Management System (LMS) is to have the interface simple yet intuitive and at the same time not compromising on features. Hence, every effort was made to present the learning through a simple interactive powerful interface.
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I thank my fellow classmates for the interesting discussions and all the fun we had over the last two years.
CHAPTER 1

INTRODUCTION

1.1 OVERVIEW

Learning methods have evolved rapidly from book reading to learning through electronic means. With the boom in technology and the increase in use of the computers towards electronic learning, the electronic medium has evolved to be one of the most important and easier methods in learning.

The goal of this project is to provide students visibility into the imports and exports data of the United States. Leveraging technology to present the imports and exports data gives the ability to present the information in a stimulating and interesting manner. This could become an effective means of learning, not just for typical classroom size students, but also can be scaled for handling bigger classes with great ease. The application is particularly well suited for self-study or an assigned project. Students instead of relying on traditional text books can use this interactive feature of technology to stimulate further interest in learning.

Countries wanting to import products will find it useful to balance imports with exports. The difference in value between imports and exports is known as the Balance of Trade, and this is released quarterly, and paid attention to by stock markets throughout the world. While many other factors are involved, if the USA exports more to Europe than it imports, the dollar might rise against the Euro in currency markets.

Historically the US has had a negative Balance of Trade worldwide, and this thesis application will make it possible to chart the balance of trade over time. Conversely, Japan and Germany usually have had positive balances of trade because of popular exports, like cars.

Energy is a very big component. The USA has been a major importer of oil, and this accounted for much its negative balance of trade. But the US has extremely large reserves of oil and natural gas, and could become a net exporter in a handful of two of years.
Free trade agreements are a growing trend in which countries try to reduce consumer costs by not erecting trade barriers in the form to quotes or tariffs. NAFTA is the North America Fuel Trade Association, agreed to by Canada, Mexico, and the USA.

These agreements are long complex documents where the players try to find tradeoffs of net mutual benefit to all parties. There is no nice way to trace this in a GIS product, but links are provided to the user to explore this topic.

1.2 MOTIVATION

International trade is important. A positive trade balance is good for employment and the economy in general. And there are a number of political issues. Protectionism, wherein a country charges tariffs on imports, or subsidizes exporters in its own country, is a frequent tactic, and usually brings reprisals. Such things are popular with local workers, who do not have to compete on a world stage. But consumer costs go up, and the incentive to reduce production cost goes down. So-called free trade agreements, bilaterally or among a group of nations, are a dramatically different approach, and have considerable support.

Understanding of these issues is not great, and most people have a minimal knowledge about their country’s exports, imports or trade agreements, and the consequences thereof. The goal of this application is to make users aware of these facts and strategies, by using maps and recent data and other sources to present the highlights of trade for the USA, and to a lesser extent other countries. There is an emphasis on good sources of information, so that the motivated user has a good idea of how to pursue this topic further. In addition this application explores the shipping industry through which bulk trade is accomplished. The same issues apply within a country to its major subdivisions, be they states, or provinces, or whatever. A state that successfully builds up trade has revenue sources superior to those of other states. This thesis does not attempt to deal with intra-country trade and legal issues, but they are also important. Many states have favored some health insurers over others, namely those with a local presence, and it has been argued that allowing all insurance companies to sell across state lines would reduce consumer costs. Related issues are ‘right to work’ laws and minimum wage laws. Each country and state must find a balance between worker benefits and wages, and being a strong competitor. Education and innovation can tip the scales in one country’s favor as well.
Chapter 2 discusses the technologies used to develop this application.

Chapter 3 discusses the project requirements and framework/data requirements of this project.

Chapter 4 discusses Toolbars used in MOJO.

Chapter 5 discusses the top categories of Imports and Exports of the United States and also highlights the countries that import/export goods from/to USA.

Chapter 6 is about transportation of goods by land and by sea.

Chapter 7 is about USA ports of entry.

Chapter 8 discusses economic indicators like Baltic Dry Index and Balance of Trade.
CHAPTER 2

TECHNOLOGY

2.1 FOCUS ON GIS

Geographic Information System (GIS) is a term that refers to a blend of geography and computer technology. GIS integrates hardware, software, and data for capturing, managing, analyzing, and displaying all forms of geographically referenced information. It also allows the user to interpret the data in the form of maps, globes, reports and charts [1]. GIS is widely used to find out nearby attractions to the user, ex: restaurants, friends, parks, etc.

2.2 MAP OBJECTS – JAVA EDITION

ESRI provides a pure Java solution for adding dynamic maps to applications with the release of MapObjects-Java Edition. MapObjects-Java Edition also includes prebuilt JavaBeans that are easily used in an integrated development environment such as Eclipse or Net beans [2].

Key features:

- Ability to create customized maps by combining multiple data sources like local, Internet, and Intranet.
- Wide range of GIS capabilities.
- Used to create feature layers from their own custom data sources.
- It provides an extensive Java-based application programming interface for developers to build client geographic-based display, query, and data retrieval applications.
- Includes plenty of helpful resources such as a guide to building applications, a programmer’s reference.

There are special MOJO classes called 'beans'. The most prominent one is the Map bean, a class, and it is used to create maps. A map consists of layers known as themes. For example, an India map can have a base map layer showing state boundaries and a layer
showing state capitals and a layer showing lakes. All these layers when superimposed give a map. Map layers can also be 'beans' [3].

Map Objects can be described as a "component architecture", where the components are contained in 17 jar files in the Map Objects software, of which 2 are needed for this application. A component architecture is where powerful classes can be easily added and blended to create applications in as easy way, and Virtual Basic is another example.

There are two MOJO pre-built Toolbars in this application.

- a. ZoomPan Toolbar
- b. Selection Toolbar.

Detailed description of these Toolbars and a custom toolbar are found in chapter 4 of this document.

2.3 INTRODUCTION TO JAVA

Java is a programming language that is concurrent, class-based, and object-oriented. It is intended to let application developers “write once, run anywhere”, meaning that code that runs on one platform does not need to be recompiled to run on another. Java applications are typically compiled to byte code that can run on any Java Virtual Machine (JVM) regardless of computer architecture [4].

- **Java is Simple**: Java looks familiar to most C and C++ programmers as most of the Java syntax is similar to C and C++. In java complex features that are included in C++ like pointer arithmetic and multiple inheritance were eliminated. Java has no header files and pointers and hence it is easy to write, learn and debug for the user. In addition, Java has a Garbage Collection feature due to which there is no need for the programmer to worry about storage management.

- **Java is Object-Oriented**: Java is Object-Oriented which means it primarily focuses on objects. It has methods that manipulate the objects and the object has state and behavior. Objects interact with each other by sending messages. Here objects correspond to things. In java everything must be placed in a class descended from the object class and a class is a collection of similar objects.

- **Java is Robust and Secure**: Java has automatic garbage collection which prevents memory leakage by checking the usage of objects and removes the unused objects from memory. It has extensive compile-time and runtime error checking due to which bugs can be found early. Java has access restrictions like public, private and protected.
Java is interpreted: After compiling the java code, the compiler outputs the java byte code. The byte code is then run through a java interpreter on any given platform. The interpreter converts the code to the target hardware and executes it.

Java is Multithreaded: Java is multithreaded which means two or more parts of a program can be run concurrently and each part is called a thread. It is a form of multitasking. Due to multithreading the CPU idle time can be minimized. GIS is an area that profits from multi-threading due to complex visual displays. A number of user goals have been found to require multiple threads in Map Objects.

Java is Easily Deployed: Java has executable JAR files which makes it easy to deploy java applications.

Java is Portable: Java has a feature Write-once-run-anywhere which makes it portable provided that the system must have an interpreter for the Java Virtual Machine (JVM). The data sizes in Java are standard irrespective of operating system.

Java is very capable of generating GUI’s: Java originally used AWT, Abstract Windowing Toolkit, then upgraded that to Swing. More recently they introduced javafx, but this does not add much in power for this thesis, and it would constrain users to have Java 1.8, or a close predecessor.

Chapter 3 discusses the project requirements and framework/data requirements of this project.
CHAPTER 3

PROJECT REQUIREMENTS

The objective of this interactive GIS tool is to provide user information about the imports and exports of the United States for a period of ten years. This project was developed under the guidance of Dr. Carl Eckberg (San Diego State University, Computer Science department). Requirements were determined by the thesis supervisor, Dr. Carl Eckberg. Requirements are divided into these broad categories:

- a. Framework/Data requirements
- b. Platform requirements

3.1 FRAMEWORK/DATA REQUIREMENTS

The required framework for the GIS tool like shape files, and map classes are provided through Environmental Systems Research Institute (ESRI). Data pertaining to the imports and exports data of the United States was retrieved from the United States Government for a period of ten years. The United States imports & exports several commodities to several countries, and to map all these commodities for all countries of the world would be an overwhelming task. Hence in order to scale feasibly to the project, the methodology followed was as follows:

1. Obtain the Top 10 Categories (by USD over a period of ten years) for imports
   a. Within imports, identify the top ten countries for each category
2. Obtain the Top 10 Categories (by USD over a period of ten years) for exports
   a. Within exports, identify the top ten countries for each category

3.1.1 Categories Selected for Imports

- Crude oil
- Passenger cars, new and used
- Other parts and accessories of vehicles
- Cell phones and other household goods
- Pharmaceutical preparations
- Computers
- Computer accessories
- Telecommunications equipment
- U.S. goods returned, and reimports
- Apparel, household goods – cotton

3.1.2 Categories Selected for Exports

- Crude oil
- Passenger cars, new and used
- Other parts and accessories of vehicles
- Cell phones and other household goods, n.e.c.
- Pharmaceutical preparations
- Computers
- Computer accessories
- Telecommunications equipment
- U.S. goods returned, and reimports
- Apparel, household goods - cotton

Agricultural imports/exports are treated separately, since they can be critical even though they are not at the top by dollar volume, and because they represent a major export category for a number of states in the country.

3.2 Platform Requirements

MOJO can be developed in almost every environment. The platform that was used for this was Net Beans IDE. The following steps were followed to develop this project using Net Beans.

The following steps are to be followed to develop a project using the Net Beans IDE.

- a. Create a new Java application by clicking on the Java folder and then select Java Application as shown in Figure 3.1.
- b. Provide a project name and click on next button at the bottom as shown in Figure 3.2.
- c. Create a library by right clicking on the libraries and then click the on create button as shown in Figure 3.3.
Figure 3.1. Creating new Java project.

Figure 3.2. Providing project name.
Figure 3.3. Creating new library.

- d. In the class path tab click on Add JAR/Folder button.
- e. Then navigate to the folder where all the library files are located.
- f. Select all the libraries and click on ok as shown in Figure 3.4.

Figure 3.4. Selecting libraries.
After creating a new project (can specify any name), provide a project name; in the same screen shot you will see a project location and project folder, which mean the actual project is present in that location and folder. If those two fields are not filled in by default, click on the browse button and give the path where your project is actually located and click on the next button at the bottom and click on the ok button.

After providing a project name, create a library by right clicking on the libraries and then click the on create button. Figure 3.3 shows how to create a library. In the Available Libraries select Global Libraries and click on the create button on the right side. A dialog box will open with two fields such as Library Name and Library Type. The user can give any library name and for Library Type select Class Libraries from the drop down list.

After creating a library, in the class path tab click on Add JAR/Folder button.

Chapter 4 discusses the Toolbars used in MOJO.
CHAPTER 4

INTRODUCTION TO MAP OBJECTS TOOLBARS

Various Toolbars are provided by MOJO which are used to perform various actions while the actual project application is running. The first toolbar, the Zoompan Tool bar, used during development of this project includes these tools: Zoom In, Zoom Out, Zoom to previous extent, Pan, Pan to one direction, and Identify. The Selection toolbar includes Query Builder, Select Feature, deselecting the feature, Find tool, attribute tool, clear all selections, Buffer, and Search. The preceding tools are in toolbars supplied by map objects with the names.

- a. ZoomPanToolbar
- b. SelectionToolbar

4.1 ZOOMPAN TOOLBAR

The tools that come under ZoomPan Toolbar are as shown in the Figure 4.1.

![Figure 4.1. ZoomPan toolbar.](image)

Below are the list of tools that are present in ZoomPanToolbar and their functionalities.

- Zoom In: Zoom the map for viewing a particular state/area in a closer view.
- Zoom Out: Zooms out the current view of the map.
- Zoom to previous extent: Restores the original view of the map after performing Zoom In/Zoom Out action
- Pan in One Direction: Moves the map to a particular direction i.e., East, West, North, South.
- Identify: Shows information about particular selected feature in the form of what a mounts to a row of the attribute table for that layer.
4.2 SELECTION TOOLBAR

Below is the list of tools that are present in the Selection Toolbar and their functionalities. These tools enable the user to select a set of features from a layer in the map. Figure 4.2 shows the tools that are present in the Selection-Toolbar.

![Figure 4.2. Selection toolbar.](image)

- **Find**: Opens a dialog window to find some information related to the selected layer. The user can provide a value in the value dropdown box and can get information about that particular feature and also can perform some of the actions like Pan To and Zoom To.

- **Search**: A dialog windows opens which locates features determined by predefined stored query.

- **Query Builder**: Opens a dialog window which gives an option to the user to execute a SQL query and displays the respective features on the map layer. This window actually allows you to enter an SQL where clause in lieu of making a lot of clicks in the matrix, and expands the searches that can be made.

The pop-up window for Query Builder is as shown in Figure 4.3.

![Figure 4.3. Query builder.](image)
- **Select Feature**: Allows the user to select feature on the map via different shapes like rectangle, circle, line and polygon.

- **Buffer**: Opens a dialog box in which the user can input the buffer distance and it will construct a buffer polygon around the selected feature.

When the user clicks on this buffer icon the following pop-up window will appear as shown in Figure 4.4. In order to use this tool, first select the layer and then click on the Select features icon and select a part of state or area on the map. If you click the Buffer icon, then a pop-up window will appear showing options like Buffer Distance, Buffer Units (with options miles, Kilometers, meters, feet in drop-down fashion). Then select a state from the drop-down menu and click on OK.

![Figure 4.4. Buffer pop-up window.](image)

Then a buffer will be drawn around the selected state/feature and all the neighboring states will be highlighted.

When a user selects a capital using the buffer tool then it will show up as a circle around that city as shown in Figure 4.5.

![Figure 4.5. Circle mark window.](image)

Clear All Selection: Clears out the currently selected feature on the map.
- Attributes: provides attributes of the currently selected features in the form of a table. The attribute table for this project is as shown in Figure 4.6.

![Attribute Table](image)

**Figure 4.6. Attribute table.**

4.3 **CUSTOM TOOLBAR**

The custom Toolbar provides additional tools for the user. Figure 4.7 illustrates the tools present in the custom Toolbar. Custom tools have functions that must be programmed in Java by the developer.

![Custom toolbar](image)

**Figure 4.7. Custom toolbar.**

- **Print Map**: Allows the user to print current view of the map by displaying a dialog window as shown in Figure 4.8.
• **Add Layer**: Provides a facility for the user to add a new layer to the table of contents. When the user clicks on this button a dialog window will open as shown in Figure 4.9 and this allows the user to add any shapefile or an image file, ArcIMS and ArcSDE. When the user selects the Shapefile tab and then clicks on the icon that is to the right side of the window, it prompts the user to select the shapefiles of the user's choice.

• **Pointer**: This tool helps in removing the special behavior of the last tool selected and restores the cursor to its normal arrow icon.

Chapter 5 discusses the top categories of Imports and Exports of the United States and also highlights the countries that import/export goods from/to USA.

The custom Toolbar provides additional tools for the user such as Print map, add layer.

Add Layer Provides a facility for the user to add a new layer to the table of contents.
Figure 4.9. Add layer.
CHAPTER 5

IMPORTS AND EXPORTS OF THE USA

This chapter contains information about imports and exports of the USA and also describes the implementation of the application.

The following screenshots describe how to use the application to get information about imports and exports of the top ten categories of the United States.

1. The initial view of the project is as shown in Figure 5.1
2. There are two menu options provided for the user, one for imports and one for exports and these are in drop down list fashion that display top ten categories as shown in the Figure 5.2 (Import Categories) and Figure 5.3 (Export Categories).
3. Figure 5.2 describes the top import categories for the USA from the past ten years. Detailed descriptions of some of the import categories are explained in the next sections of this document.
4. After selecting a category either from import/export top ten countries, the respective category will be highlighted with appropriate names as shown in Figure 5.4
5. The user can find more information in the form of a graph for each category like the amount of export/import in millions for the past ten years. The graphs are “static” and in the future could profit from being dynamic. A charting facility was very recently developed by another student. For this the user can take the pointer icon present in the custom Toolbar and click on any highlighted country. Then a graph will be displayed which shows total import/export in millions on the Y-axis and import/export year on the X-axis as shown in Figure 5.5

5.1 IMPORTS CATEGORIES

In this application user can find information on top 10 import items of the United States and below are details of few of them.

5.1.1 Crude Oil

Crude oil is the top most import category of the United States. The U.S Energy Information Administration predicts that by 2015, the imports of crude oil will fall to an average of 21% as U.S shale oil production increases. Imports of oil and fuels by oil companies increased at about 60% in 2005 [5]. United states imported the most crude oil from Canada.
Figure 5.1. Initial view.

Figure 5.2. Import categories.
Figure 5.3. Export categories.

Figure 5.4. Highlighted categories.

Figure 5.6 depicts the highlighted countries that the United States imported crude oil from.

Total import/export in millions on the Y-axis and import/export year on the X-axis. Figure 5.6 shows top 10 countries from where United States imports Crude oil.

Additionally North America is experiencing a crude oil supply boom, primarily due to the production growth in the Canadian oil sands and shale oil production expansion from the Bakken fields in North Dakota and Montana as well as the Eagle Ford and Permian Basins in Texas. With all these developments, U.S now meets 66% of its crude oil
Figure 5.5. Displaying graph.

Figure 5.6. Top 10 countries from where United States imports crude oil.

requirement from production in North America, thus reducing imports from overseas and positioning the U.S to have excess oil and refined product supplies in some regions [6].

Historically, pipelines and oceangoing tankers have delivered vast majority of crude oil to U.S. refineries almost accounting for 90% in barrels in 2013. Even though the other modes of transportation (rail, barge and truck) have accounted for a mere 10% of the imports, these transportation modes are continuing to increase as the medium of transport for crude oil [6].

Figure 5.7 shows Mode of Transportation for Crude Oil between year 2008 and 2013 [7] and the top 10 countries from which United States imported passengers cars.
Figure 5.7. U.S. refinery receipts of crude oil by mode of transportation.

5.1.2 Passenger Cars

Figure 5.8 gives a clear picture on the amount of passenger cars that the United States imported from Canada and Mexico.

Figure 5.8. Top 10 countries from which the United States imports passenger cars.

Clicking on a particular country shows the amount of imports over the last 10 years. Figure 5.9 gives a clear picture on the amount of passenger cars that the United States imported from Mexico.
5.2 EXPORTS CATEGORIES

In this application user can find information on top 10 export items of the United States and below are details of few of them.

5.2.1 Petroleum Products

Oil was first discovered in the Oil Creek area of Titusville, Pennsylvania in 1859. Since then petroleum has been a major industry in the United States. In 2008 Gulf of Mexico was the leading oil producing area in the United States. It produced 1.15 million barrels per day. The next state which is leading in oil-producing was Texas which produced 1.09 million barrels and then Alaska and then California [8].

Petroleum was the largest source of energy in 2008 in the United States. The primary sources of U.S. imported oil are Canada, Saudi Arabia, Mexico, Venezuela and Russia [8]. Recently much oil has been produced in North Dakota by fracking.

Figure 5.10 shows the top ten countries to which the United States exported Petroleum.
5.2.2 Semiconductors

A Semiconductor is a material which has electrical conductivity between that of a conductor such as copper and that of an insulator such as glass. Semiconductors are the foundation of modern electronics, including transistors, solar cells, light-emitting diodes (LEDs), quantum dots and digital and analog integrated circuits [9].

Table 5.1 shows the top semiconductor companies and their country of origin [9].

<table>
<thead>
<tr>
<th>Company</th>
<th>Country of origin</th>
</tr>
</thead>
<tbody>
<tr>
<td>Samsung Electronics</td>
<td>South Korea</td>
</tr>
<tr>
<td>Qualcomm</td>
<td>United States</td>
</tr>
<tr>
<td>Texas Instruments</td>
<td>United States</td>
</tr>
<tr>
<td>Toshiba Semiconductors</td>
<td>Japan</td>
</tr>
<tr>
<td>Renesas Electronics</td>
<td>Japan</td>
</tr>
<tr>
<td>Hynix</td>
<td>South Korea</td>
</tr>
<tr>
<td>STMicroelectronics</td>
<td>France/Italy</td>
</tr>
<tr>
<td>Broadcom</td>
<td>United States</td>
</tr>
<tr>
<td>Micron Technology</td>
<td>United States</td>
</tr>
</tbody>
</table>

Figure 5.11 shows the countries to which the United States exports semiconductors.
Figure 5.11. Top 10 countries to which the United States exports semiconductors.

5.2.3 Code Snippet

Below is the code which reads data from Imports and Exports excel.

```java
public List<Double> readData(String item, String country, int i) throws Exception {
    List<Double> data = new ArrayList<Double>();
    try {
        fis = new FileInputStream(filename);
        XSSFWorkbook workbook = new XSSFWorkbook(fis);
        XSSFSheet sheet = workbook.getSheetAt(i);
        Iterator rows = sheet.rowIterator();
        if (rows.hasNext()) {//ignore first row
            XSSFRow row = ((XSSFRow) rows.next());
        }
        while (rows.hasNext()) {
            XSSFRow row = ((XSSFRow) rows.next());
            Iterator cells = row.cellIterator();
            XSSFCell cell = (XSSFCell) cells.next();
            strColumn1 = cell.getStringCellValue();
            if (strColumn1.equalsIgnoreCase(item)) {//It is the selected import item
```
cell = (XSSFCell) cells.next();
strColumn1 = cell.getStringCellValue();
if (strColumn1.equalsIgnoreCase(country)) {
for (int j = 0; j < 10; j++) {
    cell = (XSSFCell) cells.next();
data.add(cell.getNumericCellValue());
}
break;
}

5.3 AGRICULTURAL IMPORTS AND EXPORTS OF USA
Below is the list of agricultural imports and exports of the United States which gives details like amount of goods imported or exports from/to other countries over a period of time.

5.3.1 Imports
U.S. agricultural imports have continued to grow since 1990. The largest U.S. agricultural imports are horticultural products which accounted for about half of all U.S. agricultural imports since 2002. Horticultural products include fruits, vegetables, wine, nuts, beverages, malt, and nursery products.

Much of these imports come from two leading suppliers namely Canada and Mexico. NAFTA (North American Free Trade Agreement) is partially responsible for expansion of this trade between Canada, Mexico, and the United States.

Sugar and tropical products like coffee, cocoa, and rubber are imported from Indonesia, Canada, Brazil, and Mexico by USA. Both types of products (sugar and tropical) have exceeded livestock and livestock product imports since 2005. The next most important agricultural imports of the U.S. are animals and animal products. Canada, Mexico, and Oceania are large suppliers of animals and animal products to the United States.

U.S. imports came from Canada, Mexico, the European Union, Australia, Brazil, and China in the last decade. Imports from the European Union are reducing, while imports from
countries like Canada, Mexico, and the rest of the Americas are increasing. Since 2001 imports from China are steadily increasing.

Since 2000, the value of U.S. agricultural imports increased with growth across bulk and high-value product categories. Some of the processed high-value products like coffee, wine, and malt beverages continue to account for the largest share of U.S. agricultural imports. Also, raw and semi-processed high-value product imports like rubber and rapeseed oil are also rapidly growing [10].

In 2009, food consumption of U.S. was 654 billion pounds, and out of this, imports accounted for 110 billion pounds which is about 17%. One good approach to estimate the percentage of imports is the measure of the ratio between the physical weights of food imports to total food consumed. The import share estimate is 16.8% in 2009 based on volume and 17.3% based on value. In 1990, the share estimates from volume and value were both 11%.

Bulk products include grains, oilseeds, cotton, and tobacco. Raw includes live animals, fresh fruits and vegetables, nuts, and nursery products. Semi-processed products includes fats, hides, feeds, fibers, flour, meals, oils, and sugar products. Processed includes meat, milk, grain products, processed fruits and vegetables.

For plant products, the import share went from 16.8% in 1990 to 25.6% in 2009. The share of imports relative to the volume of food consumption in 1989 was 11% and in 1997 it was 13% and in 2004 it was 15% and 16.8% in 2009. These increasing imports shares reflect the 2.6% growth of per capita food imports which expanded from 227 pounds in 1989 to 358 pounds in 2009 [11].

5.3.2 Exports

The bulk commodities that accounted for U.S. agricultural exports are wheat, rice, coarse grains, oilseeds, cotton, and tobacco. Among these bulk commodities only soybeans had a significant increase in exports between 1995 and 2013. In the 1990s, US exports of consumer-oriented products including high-value products (HVP) such as dairy products, poultry, live animals, meats, oilseed meals, vegetable oils, fruits, vegetables, and beverages showed steady growth.
Exports of all consumer-oriented products increased by at least 20% and as much as 400% in the case of dairy products.

In 2012 the U.S. leading agricultural export destination was China which replaced Canada. In 2013, China was again the largest destination of U.S. agricultural exports. Other destinations for U.S. agricultural exports include the European Union and Asia.

Since 1995, there has been strong growth among consumer-oriented products commodities. Middle-income countries became the primary source of growth in U.S. agricultural exports, with U.S. agricultural exports to upper middle-income countries like China and Mexico being very important. Middle-income countries now account for the largest share of U.S. agricultural exports of both bulk and semi-processed products such as wheat, soybeans, and soybean meal [12].

The value of U.S. agricultural exports increased from 485 billion in 1995 to over $144 billion in 2013 [12].

5.4 DATA SOURCES FOR IMPORTS AND EXPORTS

The data leveraged in the application is sourced from http://www.census.gov/foreign-trade/statistics/country/. Once a user visits this website, there is "product detail and partner country" category, within this category a sub-category called "End-Use". Under this sub-category user can download imports and exports data for the last ten years. Figure 5.12 gives an idea from where the data has been taken from.

Figure 5.12. Data sources for imports and exports.
CHAPTER 6

MAJOR SHIPPERS

Every country in the world imports goods from other countries and exports its own wares to other countries. But these transactions are done on a very large scale and often involve lot of goods being transported using ships, airplanes, etc. Some of the most important means of transportation are Bulk carriers, Tankers and Container ships.

6.1 TANKER

A tanker also known as a tank ship, is designed to transport liquids or gases in bulk. Oil tanker, Chemical tanker and Gas carrier are major types of tank ship. According to Lloyd's register Fairplay, there were 1,339 chemical parcel tankers in use in the world and 1,666 chemical/oil product tankers and 1,866 crude oil tankers and 177 LNG tankers and 1,025 LPG tankers. Below is the wide range of products that are carried by tankers.

1. Hydrocarbon products such as oil, liquefied petroleum gas, liquefied natural gas.
2. Chemicals such as ammonia, chlorine and styrene monomer.
3. Fresh water
4. Wine
5. Molasses [13]

6.1.1 Chemical Tanker

Chemical tankers which transports chemical in bulk via ocean ranger from 5,000 DWT (deadweight tons) to 35,000 DWT in size. These tankers have a series of separate cargo tanks which are coated with phenolic epoxy or zinc paint or stainless steel.

The coating or cargo tank material determines what type of cargo a particular tank can carry. For example, stainless steel tanks are required for aggressive acid cargoes like sulfuric acid and phosphoric acid. Epoxy coated tanks are used for carrying vegetable oil [14].

Below is the list of chemicals transported in bulk.

- sulphuric acid, phosphoric acid, nitric acid, chlorhydric acid, caustic soda and ammonia.
• Molasses and alcohols.
• Vegetable oils (soya, palm nut, sunflower) and animal oils (fish, lard oils).
• Coal tar products such as benzene, phenol, naphthalene.

The chemicals that are transported in the Baltic sea are ammonia, phenol, phosphoric acid, methanol, sulphuric acid, styrene monomer, caustic soda [15].

6.1.2 Oil Tanker

An oil tanker, which is also called a petroleum tanker, is used for bulk transport of oil. Crude tanker and product tanker are two types of oil tankers. Crude tankers move large quantities of unrefined crude oil from its point of extraction to refineries. Coming to product tankers, these are smaller in size and are used to move refined products from refineries to points near consuming markets.

Tankers transport $2.2 \times 10^9$ short tons of oil every year. The average cost of oil transport by tanker amounts to only 2 to 3 United States cents per 1 US gallon [16].

6.1.3 Gas Carrier

This is designed for transporting liquefied natural gas. The world's first ocean cargo of LNG was Methane Pioneer, and left the Calcasieu River on the Louisiana Gulf coast on 25 January 1959. It sailed to the UK where the cargo was delivered. Now this giant LNG ship carries up to $266,000 \text{ m}^3$. At the end of 2005, a total of 203 vessels have been built, out of which 193 are still in service.

In order to facilitate transport, natural gas is cooled down to $-163 \, ^\circ\text{C}$ (approximately) at atmospheric pressure, at which the gas condenses to a liquid. The tanks on board an LNG carrier function as thermoses to keep the liquid gas cold during storage. The liquid is constantly boiling during the voyage as no insulation is perfect [17].

6.2 Container Ship

These are the cargo ships that carry their load in a technique called containerization. In general these are boxes or containers within a box. Containers are made in steel, aluminum. Container ship capacity is measured in twenty-foot equivalent units (TEU).

A major characteristic of a container ship is whether it has cranes installed for handling its cargo. The container ships that have cargo cranes are called geared, and those
that don't have are called ungeared or gearless. Geared cranes are more flexible than gearless in the sense that these geared cranes can visit ports which are not equipped with pier side container cranes but at the same time they've disadvantages too. One of them is geared ships incur recurring costs owing to maintenance and fuel costs.

There are two main types of dry cargo carriers, namely bulk cargo and break bulk cargo. Bulk cargoes like grain or coal are transported unpackaged in the hull of the ship. Break-bulk cargoes are transported in packages and are usually manufactured goods [18].

### 6.2.1 Advantages of Container Ships
- The cargo can be loaded and unloaded faster (in a few hours) than general cargo ships.
- More voyages are made per year and hence more income for the shipowner.
- Less labour is required on these ships, hence cutting labor costs.
- It takes a few weeks for a consignment to be delivered, hence reducing shipping times between ports.
- It resulted in less breakage due to less handling.
- These containers are sealed and opened only at the destination so theft levels have been reduced greatly.
- Raw materials arrive from factories in sealed containers less than an hour before they are required in manufacture, hence reducing inventory expense.

### 6.2.2 Disadvantages of Container Ships
- The introduction of container ships did not have an easy passage. Ports, railway and shippers were all concerned about costs of developing and maintaining the ports and railway infrastructure to handle container ships and also for the movement of these containers on land by road and rail.
- Containers eliminate several manual jobs of cargo and hence trade unions were concerned about job loss.
- There is much complexity in arranging containers both on the ground and on modes.

### 6.3 Bulk Carriers
These are used to transport unpackaged bulk cargo like coal, grains, coal, ore and cement. There are various designs of bulk carriers in which some can unload their own cargo, and some package the cargo as it is loaded.
Korea is the largest builder of bulkers and about 82% of ships were built in Asia. Crews in bulk carriers are involved in the loading and unloading of cargo, navigating the ship, maintaining its machinery and equipment. Coming to loading and unloading, it is very difficult to load and unload cargo and can take up to 120 hours on larger ships. The size of crew can vary depending on the size of the ship. There can be three people on the smallest ships and over 30 on the largest ships.

In 2005, 1.7 billion metric tons of coal, iron ore, grain, bauxite and phosphate was transported by ship. Many bulkers are registered in Panama [19].

This project explains ten major shipping companies in the world which includes the goods transported, their headquarters and also size of the fleet.

### 6.3.1 Ship Finance International Limited

- Ship Finance International limited is listed under New York Stock Exchange (NYSE:SFL) as a major vessel owning company.
- It operates a FLEET that contains 70 vessels which includes 19 crude oil tankers, 2 chemical tankers, 14 dry bulk carriers, 24 container vessels, 2 car carriers, 6 offshore supply vessels, 2 jack-up drilling rigs, 2 ultra-deepwater semi-submersible drilling rigs and 1 ultra-deepwater drillship.
- Major goods transported are crude oil and cars [20].

Ship Finance fleet is comprised of different elements and are listed below.

- **SuezMax**
- **VLCC**
- **Dry Bulk**
- **Container**
- **Off Shore**
- **Chemical**
- **Car Carriers**

Each of the fleet category listed above varies by size and is differentiated from one another mainly by size and also the type of shipment they carry from one place to another.

#### 6.3.1.1 HEADQUARTERS

Hamilton Bermuda
6.3.1.2 **Website Organization**

Ship Finance’s website is well organized with clear categories provides users clear information about the company as well as their fleet strength.

The website is organized in the following way.

6.3.1.3 **Home Page**

The home page contains information about the company’s listing on NYSE and its Fleet strength. The homepage gives a quick summary of their naval fleet strength and other major statistics like the position of company among other shippers.

This summary & statistics provides the user with a quick overview of the company details without having to click through multiple pages. Also present on the home page are financial numbers of the company along with most recent performance of the company. Most of the company’s information listed within this documentation is utilized from this homepage.

6.3.1.4 **Fleet**

This page provides overview of the different fleet list available for the company and also the type of fleet. The information about the type of fleet provided above was taken from this page.

6.3.2 **Safe Bulkers**

- It provides marine drybulk transportation services. This company trades under the symbol "SB" and its common stock is listed on the NYSE.
- It operates a Fleet that has 32 drybulk vessels with a combined capacity of 2.9 million deadweight tons (dwt) and consists of Panamax, Kamsarmax, Post-Panamax and Capesize class vessels.
- Each subclass vessels have a range of deadweight tons (dwt) capacity and capacity ranges by subclasses are listed below:
  - Panamax – (74,300 – 78,000)
  - Kamsarmax – (81,600 – 82,300)
  - Post – Panamax – (87,000 – 95,800)
  - Capesize – (176,000 – 181,400)
- It majorly transports coal, grain and iron ore [21]
6.3.2.1 HEADQUARTERS
Monaco

6.3.2.2 WEBSITE ORGANIZATION
The organization of this website is very similar to that of Ship Finance company. On the home page is a brief summary of the corporate profile which has information about the number of vessels they carry, amount of capacity and their listing on the NYSE.

The Fleet page on the website provides stats such as number of vessels the company carries, subclasses of these vessels, capacity of vessels & other information mentioned above is taken from this page. This page also contains information on where the shipyard (country) is located at.

6.3.3 Teekay Corporation

- Teekay Corporation was established in 1973, is one of the world's largest marine energy transportation companies.
- It operates Fleet which contains 158 vessels with a capacity of 4.7 million deadweight tones.
- It transports crude oil, petroleum products and Liquefied Natural Gas (LNG) [22].

6.3.3.1 HEADQUARTERS
Hamilton Bermuda

6.3.3.2 WEBSITE ORGANIZATION
Teekay’s company website is a detailed website which provides a lot of resources related to the company, its fleet, strategy, governance, different functions of the company & other details.

The summarized information about Teekay Corporation’s fleet and type of materials it transports listed above is taken from a different website listed in the sources. However if one wishes to get detailed information about the company’s fleet, it is available under the Business tab on the home page.

Once user hovers over the business tab, different options are provided. On selecting About us option (which in turn gives other option) & then selecting Fleet takes you to a page filled with a visual map of a delayed representation of vessels and vessel positions [23].
Additionally a hyperlink titled “Click here” is available for a current list of fleet and its specifications. On clicking the link, an excel file is downloaded and the excel file contains details of each vessel the company carries, Year the fleet was built, Name of the fleet & other such information.

6.3.4 A.P. Moller–Maersk Group

A.P. Moller – Maersk Group is a conglomerate based in Copenhagen in Denmark that was established in 1904. It is considered as the largest container ship operator and supply vessel operator in the world. The company has held that distinction since 1996. It operates 600 vessels with 3.8 million TEU. It also owns the ship Emma Maersk, considered as the largest container ship in the world. The company has a presence in 135 countries around the world [24].

- A.p. Moller-Maersk Group is also known as Maersk. It is a Danish based company and was established in 1904.
- It is the largest container ship operator and supply vessel operator in the world.
- It operates Fleet with 140 vessels with a capacity of 3.8 million TEU (twenty-foot equivalent units) which includes 20 crude carriers, 91 product tankers, 21 gas carriers, 8 LNG carriers (for liquefied natural gas).
- It transports oil and gas and total oil production is more than 600,000 barrels per day (95,000 m³/d) and gas production is up to some 1 billion cubic feet (28,000,000 m³) per day [24].

6.3.4.1 HEADQUARTERS

Copenhagen, Capital of Denmark

6.3.4.2 WEBSITE ORGANIZATION

The Company’s website is organized slightly different compared to the previous three websites visited. The website has a modern metro look with several pictures and its home page contains stories from employees, its hardware information, different industries the company is in & different topics selection to get newsletters.

While the stats presented about this company is taken from Wikipedia page [24], the company’s website itself also has very detailed information. On selecting “HARDWARE” page at the top of the website, the page takes you to a graphical page where there are different categories listed to view their current fleet, look at the live map of each fleet’s
location etc. On selecting the “Explore your fleet” button, user is taken to two dropdown menus where user has the option of either looking up a fleet by its name or by the business unit.

For illustration purposes, Maersk Drilling was selected in the business unit category which then leads to a page in a matrix order with a picture of each fleet along with details like name, type, build date and the accommodation strength is populated as each matrix element [25].

### 6.3.5 Mediterranean Shipping Company
- Mediterranean Shipping Company S.A. is the world's second-largest shipping line in terms of container vessel capacity.
- It operates a Fleet which has 474 vessels with a capacity of 2,326,849 TEU (twenty-foot equivalent units) [26].

#### 6.3.5.1 Website Organization
Since the company’s website doesn’t have much detailed information, stats pertaining to the company was taken from Wikipedia site. Although the company’s website has details related to container specs, container info etc, it doesn’t have much information on type of vessels they carry or size of each fleet.

#### 6.3.5.2 Headquarters
Geneva, Switzerland

### 6.3.6 FrontLine LTD
- Frontline Ltd is the world's largest oil tanker shipping company which is based in Hamilton, Bermuda [27].
- It operates Fleet that has 76 vessels which includes 41 VLCCs (very large crude carriers) and 27 Suezmax tankers
- It operates oil tankers of two sizes: very large crude carriers (VLCCs), which are between 200,000 and 320,000 deadweight tons (dwt) and Suezmaxes, which are vessels between 120,000 and 170,000 dwt [28].
- It transports crude oil and less frequently dry cargo

#### 6.3.6.1 Headquarters
Hamilton, Bermuda
6.3.6.2 Website Organization

The website of the company is organized with a brief overview of the company, Fleet information, Investor relations on the homepage. Although data pertaining to the company was taken from Wiki pages, a detailed information on the company’s fleet is also available on the company’s website [29].

In order to get details around the fleet, there is tab at the top of the website titled Fleet. Clicking on the Fleet tab takes the user to a list of fleet with details like Type, Vessel name, Manager, Year, Yard etc. The user also has an option of sorting the fleet by these options.

6.3.7 Hanjin Shipping

- Hanjin Shipping Co. Ltd is Korea's largest and one of the world’s top ten container carriers.
- It operates Fleet that contains 200 containerships, bulk and LNG carriers.
- It transports over 100 million tons of cargo manually [30].

6.3.7.1 Headquarters

Seoul

6.3.7.2 Website Organization

The company’s website contains detailed information and has information pertaining to schedules, fleet, latest news, service etc. While the data pertaining to the company was taken from the Wiki page, the company’s website also provides similar information. Data pertaining to the company’s fleet is available within the service page. Once the user hovers over the service tab at the top of the website, four different categories are presented. (a) Overview, (b) Container, (c) Bulk, and (d) Terminal.

Clicking on the overview link gives an overview of the company’s capacity, their network and information about the different services the company provides. In order to retrieve data pertaining to Container, Bulk or Terminal service, the user can select any option once he/she is on the overview page.

For instance if the user needs to view data pertaining to Bulk service, he/she needs to click on the Bulk category listed on the left of the Overview page. Clicking on the Bulk
category, would provide the user with further options. However choosing the Bulk Vessel fleet option would provide data pertaining to fleet for Bulk vessel category. Once user is within the Bulk Vessel fleet option, two tabs (Owned Fleet, Chartered-In Fleet) tabs are presented which provides details like capacity of the fleet, year built, vessel name etc. There is also an advanced option of exporting the data to an excel file [31].

6.3.8 Hapag Lloyd

- Hapag Lloyd was established in 1970 in Germany and is a transportation based company.
- It operates a Fleet which contains 154 container ships with a total capacity of around 770,000 TEU (twenty-foot equivalent units) and a container stock of more than 1.1 million TEU [32].

6.3.8.1 HEADQUARTERS
Hamburg, Germany

6.3.8.2 WEBSITE ORGANIZATION

In order to retrieve data pertaining to the fleet, a tab within the business topic is available for users. On clicking the fleet tab, the user is taken to a page with a list of categories.

The way information about the company’s fleet is slightly different compared to other companies in the sense that this page allows users to look at fleet details based on TEU (Twenty-foot equivalent) ranges than listing by subclasses. The range list is as below

- Vessels with more than 10,000 TEU
- Vessels with 8,000 to 10,000 TEU
- Vessels with 6,000 to 8,000 TEU
- Vessels with 4,000 to 6,000 TEU
- Vessels with 2,300 to 4,000 TEU
- Vessels with less than 2,300 TEU

Each list is a hyperlink and when user clicks on a particular link, the user is taken to that category on the page and within which there is again a list of fleet names. Clicking on a particular fleet name would take the user to another page which has details like TEU capacity, year built etc.
6.3.9 China Ocean Shipping Container Line (COSCO)

- China Ocean Shipping Container Line (COSCO) is an oil transportation business which was undertaken by Dalian Ocean Shipping Company.
- It operates a Fleet of over 160 container ships with a total capacity of over 750,000 TEU (twenty-foot equivalent units).
- It transports Iron ore, grain, fertilizer, steel, timber to agricultural products, crude oil, product oil, LPG with operating 46 various liquid bulk carriers with a total capacity of 8 million DWT.

COSCO's oil transportation business is mainly undertaken by Dalian Ocean Shipping Company, which provides shipping services of crude oil, product oil, LPG and LNG, etc. with operating 46 various liquid bulk carriers, with a total capacity of 8 million DWT (deadweight tons) [33].

6.3.9.1 HEADQUARTERS
Beijing, China

6.3.9.2 WEBSITE ORGANIZATION
COSCO is a parent company that has a wide variety of vessels like bulk shipping, tanker shipping etc. In order to get fleet details, the user needs to select a particular category and selection of a category takes the user to sub-companies under COSCO who carry these vessels. Data pertaining to the company's container ships is available within the Business Areas menu and subsequently selecting container within the shipping category.

6.3.10 Nippon Yusen Kabushiki Kaisha

- Nippon Yusen Kabushiki Kaisha (NYK) is a Tokyo based company in Japan and is one of the largest shipping companies in the world.
- It provides services with the world's largest car carrier fleet of about 120 vessels.
- It transports Iron ore, coal and woodchips.
- It provides tankers that transport crude oil; product tankers that carry petroleum products' chemical tankers that transport chemical products and LPG tankers that carry LPG and ammonia [34].

6.3.10.1 HEADQUARTERS
Chiyoda, Tokyo
6.3.10.2 Website Organization

Information pertaining to the company’s fleet is available under the Corporate profile page listed as tab at the top of the website. The corporate profile page contains details like Message of the company, Mission & more importantly fleet of the company under the Profile category listed as Fleet:NYK group.

6.3.10.3 Fleet

NYK Group. Clicking the link takes the user to a tabular data comprising of latest two year’s fleet information with details like # of vessels under each type of vessel, dwt capacity etc.
CHAPTER 7

PORTS OF ENTRY

Ports of entry are officially designated areas where the United States imports and exports goods from. Usually the Ports of entry are at U.S. land borders, seaports and airports. There are 328 official ports of entry in the U.S. and 13 preclearance in Canada and the Caribbean.

The ports of entry are approved by U.S. Customs and Border Protection (CBP). At ports, CBP officers perform agricultural inspections in order to protect the nation from carriers of animal and plant pets or diseases that could cause serious damage to the nation's environment [35].

This application shows top U.S. states ports of entry and also depicts the goods imported/exported along with mode of transport. The mode of transport can be truck, rail, pipeline, vessel. For this project, only NAFTA trade data is considered.

The North American Free Trade Agreement (NAFTA) is a trade agreement between Canada, United States and Mexico. This agreement was signed on December 17, 1992 in San Antonio, Texas. On January 1, 1994 it came into force [36]. Below is information pertaining to U.S. Exports, Imports and Trade balance with NAFTA.

7.1 EXPORTS

U.S. goods to NAFTA in the year 2013 were $526.5 billion, up $18 billion from 2012 which is up to 3.5% and up 97% from 2003. The top categories of exports in 2013 were Machinery ($83.8 billion), Vehicles parts ($73.3 billion), Mineral Fuel and Oil ($47.7 billion) and Plastic ($28.3 billion).

U.S. exports of agricultural products to NAFTA countries is $39.4 billion in 2013. Categories include: processed food ($2.6 billion), fresh fruit ($2.5 billion), dairy products ($2.0 billion) and fresh vegetables ($2.0 billion) [37].
7.2 Imports

U.S. goods imports from NAFTA totaled $612.5 billion in 2013, up $11 billion from 2012 which is up 1.8%, and up 70% from 2003. The top categories of imports in 2013 were Mineral Fuel and Oil which was $144.2 billion, Vehicles which was $115.3 billion, Electrical Machinery which was $65.3 billion and Machinery which was $62.4 billion.

U.S. imports of agricultural products from NAFTA countries totaled $39.4 billion in 2013. Categories include fresh vegetables which was $5.8 billion, snack foods which was $4.7 billion, fresh fruit ($3.3 billion), processed fruit and vegetables ($6.2 billion) and res meats ($2.4 billion) [37].

7.3 Trade Balance

The U.S. goods trade deficit with NAFTA was $86 billion in 2013 which was a decrease of $7 billion over 2012.

The United States had a services trade surplus of $43.7 billion with NAFTA countries in 2012 which is up 4.6% from 2011 [37].

This application provides user to select any state under ports of entry menu and when a state is selected all cities ports of entry associated with that state are displayed on the map which is point shapefile. When user clicks on any city with the help of ports of entry button, a bar graph will be displayed which shows top 10 commodities & Mode of transport on X-axis and Amount in USD on Y-axis. Before selecting the ports of entry button, user has to zoom in the map with the help of zoom in button, so the points on the map will be seen clearly. The leftmost button which consists of USA map is used as ports of entry button as shown in Figure 7.1.

![Ports of Entry](image)

**Figure 7.1. Ports of entry button.**

Figure 7.2 shows the graph with top 10 commodities & Mode of transport on X-axis and Amount in USD on Y-axis which is displayed when user clicks on any city with the help of ports of entry button.
Figure 7.2. Ports of entry graph.

7.4 CODE SNIPPET

Below is the code for ports of entry data.

```java
public void showSelection(Object[][] row, Object[] col) {
    java.util.List<PortOfEntryData> listPOED = USATradeMOJO.mapPOED.get("" + row[0][1]);
    double[] data = new double[10];
    String[] xlabel = new String[10];
    int counter = 0;
    for (int i = 0; i < listPOED.size(); i++) {
        PortOfEntryData portOfEntryData = listPOED.get(i);
        if (portOfEntryData.getCity().equalsIgnoreCase("" + row[0][2])}){
            data[counter] = Double.parseDouble(portOfEntryData.getTotal());
            xlabel[counter++] = portOfEntryData.getCombination();
        }
    }
}
```
        }
        System.out.println("Selected City:"+row[0][2]+","+data.length);
        final PortOfEntryGraph graph = new PortOfEntryGraph("" + row[0][2], data.xlabel);
        graph.pack();
        RefineryUtilities.centerFrameOnScreen(graph);
        graph.setVisible(true);
    }
}
CHAPTER 8

ECONOMIC INDICATORS

8.1 BALTIC DRY INDEX – BDI (BALDRY)

The Baltic Dry Index is a daily average of prices to ship raw materials. It is a representation of the cost paid by an end customer to have a shipping company ship raw materials across seas on the Baltic Exchange, the marketplace for brokering shipping contracts [38]. The Baltic Exchange is a medium for buyers and sellers of contracts and forward agreements for delivery of dry bulk cargo [39].

This index is also increasingly being used as an overall economic indicator as the index shows where end prices are heading for items that leverage raw materials shipped in dry bulk.

The cargoes being transported are basic raw material commodities such as coal, steel, cement and iron ore. The prices of these shipping contracts are determined by the buyers and sellers and then the exchange of goods take place over 20 different routes throughout the world for various materials and then averages into the index. Finished goods or container ships are not a factor for the index but dry bulk specific ships and raw materials are components considered in the calculation. Also, in order to ensure a comprehensive view of the entire shipping industry when looking at various shipping costs, the Baltic Exchange looks at costs for each of the following four sizes of ships [40]:

- **Capemax** (Accounts for 10% of the global fleet) – These are ships that have a capacity of 100,000+ dead weight tons of cargo and are considered big to pass through the Panama Canal
- **Panamax** (Accounts for 19% of the global fleet) – These are ships that have a capacity of 60,000 – 80,000 dead weight tons of cargo and would barely fit through the Panama Canal
- **Handymax, or Supramax** (Accounts for 37% of the global fleet) - These are ships that have a capacity of 45,000 – 59,000 dead weight tons of cargo
- **Handysize** (Accounts for 34% of the global fleet) - These are ships that have a capacity of 15,000 – 35,000 dead weight tons of cargo

How Baltic Index can be used as an Economic Indicator:
This index is becoming one of the leading indicators of economic activity. This calculates the demand to move raw materials and precursors to production [39]. Consumer spending and other economic indicators look backwards and tell the story of economic activity. However the BDI offers a real time view into the raw material and infrastructure demand and additionally is hard to manipulate unlike other economic indicators such as unemployment rate, inflation indexes or oil prices, which could easily be influenced by government policies, speculations and other key players. On the other hand, BDI is difficult to manipulate given it is an index driven by forces of supply and demand.

As the BDI focuses on raw materials, this is important because it provides a good view into the future. Producers buy raw materials when they want to start building products or finished goods out of these raw materials and that happens only when there is a demand. Conversely, producers stop buying raw materials when they have excess inventory and that is when they stop building finished goods or carry out infrastructure projects.

Typically, demand for raw materials increase when global economies are growing [39]. Knowing when the global economy is increasing is particularly helpful for investors because it means stock prices, commodity prices and other values based commodity increases should also be increasing [39]. This statement also holds true conversely.

### 8.2 Balance of Trade

Balance of Trade is the difference between the value of goods exported and goods imported in an economy over a certain period. Balance of Trade is measured in the currency of that economy.

A positive balance is called a "Trade Surplus" (this means that particular country is exporting more than it is importing) and a negative balance is called a "Trade Deficit" or "Trade gap". Usually trade means purchase and sales. But when coming to international trade, it is imports and exports, and the balance of trade is the difference between imports and exports. The economic condition of a country can be determined by its balance of trade. If the country has a positive balance, which is a trade surplus, then it is in good economic condition.

Below are the factors that affect balance of trade.
• Cost of production which includes land, labor, taxes, capital incentives in the exporting economy.
• Cost and availability of raw materials, intermediate goods.
• Exchange rate movements.
• Non-tariff barriers which includes health, environmental or safety standards.
• To pay for imports there should be availability of adequate foreign exchange.

Trade balance affects a nation's GDP. Annual trade surpluses are a direct addition to a nation's GDP. Also, exports induce an additional increase to the GDP [41].

The United States has a trade deficit of 39001 USD Million in November 2014. Balance of Trade averaged to -12860.09 USD Million in the United States from 1950 to 2014. United States recorded a low trade deficit of -67823 USD Million in August of 2006 [42].

Figure 8.1 gives a clear picture of Balance of Trade of United States in USD [42].

![Figure 8.1. United States balance of trade.](image)

Balance of trade recorded as trade deficit in the United States in November 2014 which was 39001 USD Million. Balance of Trade averaged -12860.09 USD Million from 1950 until 2014. Low trade deficit was recorded in August 2006 which was -67823 USD Million.
The US trade deficit/Trade gap decreased to USD 39 billion in November 2014 from USD 42.3 billion in the previous month. Imports decreased by 2.2% to USD 235.4 billion in November. Imports of goods reduced by USD 5.2 billion to USD 195 billion with crude oil and fuel oil reducing by USD 2.2 billion and USD 0.7 billion. Imports of services reduced by less than USD 0.1 billion.

Exports reduced by 1% to USD 196.4 billion in November. Exports of goods decreased by USD 1.8 billion to USD 136.7 billion. Exports of services declined by USD 0.1 billion. This resulted in a decrease of transport sales by USD 0.1 billion including port services and passenger fares.

In November the United States was in trade surplus with South and Central America which was USD 4.3 billion and Brazil which was USD 0.6 billion. Deficits were recorded with China (USD 29.8 billion), European Union which was USD 12.7 billion, Germany which was USD 6.3 billion, Japan (USD 5.6 billion), Mexico which was USD 4.4 billion, South Korea (USD 2.9 billion), Italy, India, France, Canada, Saudi Arabia and United Kingdom [42].

In this application we get information on Trade Balance of all countries across the world. Along with this we can get to know whether a country is in trade surplus or trade deficit status and also the rank of that particular country in terms of balance of trade.

When a user clicks on the Balance of Trade button as shown in Figure 8.2, and clicks on any country, a dialog box will open which gives information such as name of the country, balance of trade, status, and rank.

Figure 8.2. Balance of trade icon.

Figure 8.3 shows a dialog box that is popped up when user clicks on any country with the help of the balance of trade button, which gives information such as name of the country, balance of trade, status, and rank.
Figure 8.3. Balance of trade information.
CHAPTER 9

SUMMARY

This application on imports and exports of the USA gives better idea for the users on the economy of the United States as well as top commodities that USA imports/exports from/to other countries. The web link included in the application provides detailed information of imports and exports of the USA [43]. The web link is dynamic so the user can have up-to-date information. This application also provides a chance for the user to get information on Trade Balance of all countries across the world with the help of Balance of Trade button.

Also the user of this application can get find out major shipping companies which are used for transporting goods from/to the U.S and also major port of entries in the U.S. with NAFTA.
CHAPTER 10

FUTURE ENHANCEMENTS

The requirements planned in the project beginning have been accomplished successfully and validated. The requirements were to provide users an interactive tool that would give imports & exports of the USA based on category selected. Several enhancements can be done to this project, to name a few:

1. Create a Smartphone app for this tool on all major platforms (iOS, Android, Windows etc).
2. Allow user to specify different products dynamically and generate appropriate displays.
3. Make charts dynamic in that the chart changes with the data over time.

Scale the tool for trade agreements throughout the world.
REFERENCES


