ONLINE FINANCIAL INDEPENDENCE SCORE

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In Partial Fulfillment
of the Requirements for the Degree
Master of Science
in
Computer Science

by
Aditi Singh
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SAN DIEGO STATE UNIVERSITY

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Computational Science Research Center

5/13/2013
Approval Date
DEDICATION

This thesis is dedicated to my family, my father Mr. Surendra Singh, my mother Mrs. Reetu Singh, my sister Disha and my brother Yuvraj who have always supported me and have always been my strength.
ABSTRACT OF THE THESIS

Online Financial Independence Score
by
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In today’s world getting control of your finances and planning for a secure future is very important. Economic factors like interest rates, inflation etc. and personal factors such as age, income, household size, and personal beliefs constantly keep changing and influence your spending and saving patterns. Budgeting and keeping a track of your finances can provide financial stability from these factors and prepare you for unexpected financial adversities. Such a state is called financial independence where you have sufficient wealth to live the lifestyle you choose without having to work anymore. To be able to be financially stable at a certain age, efficient planning for your financial future is needed. A good start to develop the plan involves estimating how much you will need by that age and determining whether your current program of savings and investments can provide that income. But it is much harder then it seems because people don’t know where to start from, what factors to include and how to compute. To make it easier for them, an algorithm has been devised. This thesis provides implementation of this algorithm to create an Online User Interface. It inputs various financial details of the users and computes their financial status and tells them how much money they should start saving each year or each month and how much far behind they are in order to achieve financial stability.
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<th>Abbreviation</th>
<th>Description</th>
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<tr>
<td>FIScore</td>
<td>Financial Independence Score</td>
</tr>
<tr>
<td>FI</td>
<td>Financial Independence</td>
</tr>
<tr>
<td>CPI</td>
<td>Consumer Purchase Index</td>
</tr>
<tr>
<td>PHP</td>
<td>Hypertext Preprocessor</td>
</tr>
<tr>
<td>GUI</td>
<td>Graphical User Interface</td>
</tr>
<tr>
<td>RDBMS</td>
<td>Relational Database Management System</td>
</tr>
<tr>
<td>SQL</td>
<td>Structured Query Language</td>
</tr>
<tr>
<td>URL</td>
<td>Uniform Resource Locator</td>
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</tbody>
</table>
LIST OF VARIABLES

AgeDea: Forecasted life expectancy of user.
AgeFin: Desired age of financial independence.
AgePos: Possible age of financial independence with status quo.
AgeTod: Age of users today.
AnnBas: Annuity basis for tax purposes.
AssAll: Asset allocation.
BenFin: Users’ estimated annual financial independence benefits as percentage of income.
BonHis: Historical (50 years) returns of bonds component of portfolio.
BonInt: Projected returns of bonds component of portfolio.
CapRat: Capital ratio.
EquHis: Historical (50 years) returns of the equity component of portfolio.
EquInt: Projected returns of the equity component of portfolio.
EmpCon: Users’ current annual employer financial independence contributions as a percentage of income.
FinSav: Current value of financial independence savings.
FVAPor: Future value of portfolio at financial independence.
FVAInc: Future value of income needs for first year of financial independence.
FVASav: Future value additional savings at first year of financial independence.
GenUse: Gender of user.
IncFin: Desired income at year of financial independence in today’s dollars.
IncGro: User’s estimated annual income growth rate.
IncTod: User’s current annual income before taxes.
InfHis: Historical (50 years) inflation rates.
InfInt: Projected inflation rates.
MunInt: Historical returns of municipal bonds component of portfolio.
MunInt: Projected returns of municipal bonds component of portfolio.
OthAss: Other assets available at financial independence.
<table>
<thead>
<tr>
<th>Term</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>PMTSav:</td>
<td>First year required annual savings.</td>
</tr>
<tr>
<td>PerInc:</td>
<td>Users’ estimated annual incomes during financial independence.</td>
</tr>
<tr>
<td>PosInc:</td>
<td>Possible income at retirement with status quo.</td>
</tr>
<tr>
<td>PreCap:</td>
<td>User’s desire to preserve investment capital (Yes/No).</td>
</tr>
<tr>
<td>PVAInc:</td>
<td>Lump sum needed at financial independence for net income needs.</td>
</tr>
<tr>
<td>PVASav:</td>
<td>Present value of additional savings needed.</td>
</tr>
<tr>
<td>ReaHis:</td>
<td>Historical returns of real estate component of portfolio.</td>
</tr>
<tr>
<td>ReaInt:</td>
<td>Projected returns of real estate component of portfolio.</td>
</tr>
<tr>
<td>SavNee:</td>
<td>Additional savings needed at financial independence.</td>
</tr>
<tr>
<td>SavPMT:</td>
<td>Projected savings annuity.</td>
</tr>
<tr>
<td>SavRat:</td>
<td>Savings ratio.</td>
</tr>
<tr>
<td>SavFin:</td>
<td>Users’ current annual financial independence savings as a percentage of incomes.</td>
</tr>
<tr>
<td>SocBen:</td>
<td>Social security benefits eligibility during financial independence.</td>
</tr>
<tr>
<td>TaxRat:</td>
<td>User’s tax bracket.</td>
</tr>
<tr>
<td>TaxEqu:</td>
<td>Tax rate for capital gains.</td>
</tr>
<tr>
<td>TreHis:</td>
<td>Historical (50 years) returns of Treasure bills.</td>
</tr>
<tr>
<td>TreInt:</td>
<td>Projected returns of Treasure bills.</td>
</tr>
<tr>
<td>YeaDea:</td>
<td>Number of years from the year of financial independence until death.</td>
</tr>
<tr>
<td>YeaFin:</td>
<td>Number of years until financial independence.</td>
</tr>
<tr>
<td>YeaTot:</td>
<td>Total number of years for forecasting.</td>
</tr>
<tr>
<td>YeaWor:</td>
<td>Number of years the user will work after financial independence.</td>
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ACKNOWLEDGEMENTS

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I would also like to thank my committee members, Dr. Joseph Lewis and Dr. Carl Eckberg.

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CHAPTER 1

INTRODUCTION

Economy and its effect on people changes constantly. These changes in the economy directly affect the people financially. A strong economy is one, which grows faster than the rate of population growth, which results in a higher standard of living. A poor economy, on the other hand will give rise to factors like high inflation rate, recession, increase in unemployment rate etc. These uncertain economic times result in the minds of people about the best ways to spend, save, and grow your money to secure their future.

Economic characteristics like inflation, stock market etc. measure an area much larger than you can control. What you can control is your own household economics. Economics by definition means the science to manage a household or a business financially. The first thing you need to note here is what the word economics means in terms of thinking about yourself or your family, and how you can use it to gain financial advantage. In simple terms you need to understand if the income you make is sufficient enough for yourself and your family to meet the expenses you have. Once the daily expenses are taken care of, you can start managing your finances and work towards acquiring a state of financial stability. You can wisely spend and save the money for future uncertainties. And to be able to manage your finances, one can acquire a state called Financial Independence [1].

Financial Independence (FI) pertains to the science of managing money and freedom from needing assistance from others, i.e. a state of financial stability. The word "independent" in this context means not having to depend on something or someone else for money, including your job. It means to live self-sufficiently and indefinitely with your money in such a way that you have sufficient funds to live your chosen lifestyle without assistance from others. In other words, having enough money to meet all your needs without having to work actively for basic necessities [2]. Financial independence can mean different to different people. For some people it might mean yachts, mansions, and expensive cars; while to others it might simply mean never having to worry about bills again, knowing they will
always have a comfortable home and the time and resources to enjoy their interests and hobbies. So it varies from person to person [3].

To achieve a state of FI one should be aware of his financial status, which constitutes of one’s income, investments, debts etc. and these are the factors that influence your FI. They describe what financial elements should be taken into consideration in order for one to achieve his FI. Below we discuss and describe these factors in detail.

1.1 FACTORS CONTRIBUTING TO FINANCIAL INDEPENDENCE

We have discussed above what is financial independence. In order to plan your financial stability there are many important factors that you need to consider. All these factors influence your wealth and savings for future. A few are stated as follows [4, 5]:

- **Assets and Liabilities:** Assets are items of economic value owned by a person, which can be converted into cash. Liability is an obligation that binds you to settle a debt. For instance a house mortgage. The value of your current financial status is assets minus the liabilities. A positive value indicates you still have savings after paying for liabilities but a negative value indicates that you are in debt. Thus, one should work towards increasing the asset value and decreasing the liabilities to reach their desired financial independence.

- **Current Investments and Returns:** Investment is putting money into something with expectation of gain, usually over a long term period and the rate at which one receives this gain can be termed as returns. Investments don’t always result in profit as there is a risk factor involved. The returns that you get depends on what you have invested in, what is the current market share of that particular investment, the risk factor involved in it, and whether your investments are currently taxable, or are in tax-deferred or tax-free accounts. One should better analyze his/her investments carefully in order to achieve better returns.

- **Whether your employer is contributing to a retirement plan for you (401k).**
- **Whether you contribute to Social Security Benefits.**
- **Whether you plan to continue working beyond the financial independence date and whether that income should be considered.**

Above were some of the factors involved in calculating FI and what they mean in financial terminology. The next step is to have the knowledge on how we can work on these factors in order to achieve desired FI.
1.2 HOW DOES ONE ACHIEVE IT?

A person’s FI does not depend on his age. He can achieve it at the young age of 25 or 30. If they are 30 years old and their expenses are only $500 per month and they have assets that generate $600 after income tax and is growing at a rate in excess of the impact of inflation on their living expense of $500 or more per month, they have achieved financial independence, and they are now free to do things that they enjoy without having to worry about their next meal or a roof over their head. If, on the other hand, they are 50 years old and earn a million dollars a month but still have expenses above a million dollars a month, then they are not financially independent because they still have to generate the difference each month just to stay even. In order to be truly financially independent, you need to determine how much being financially independent will cost you and what you must do to achieve it. In doing so we need to understand few financial terms and concepts.

Joshua Kennon, financial expert and author of The Complete Idiot's Guide to Investing, 3rd Edition, explains wealth as "the part of your net worth (assets minus liabilities) that generates capital gains, income, and dividends without your labor") [6]. The first concept in determining how much being financially independent will cost you is Future Value of your wealth and assets, which is defined as the worth of a sum of money in the future, after accounting for time and the impact of inflation. The second is to determine how much money you require to be financially independent. The final step in the process is to determine how much you must save annually.

This thesis describes where you stand in achieving your Financial Independence, by calculating a score termed as FIScore (Financial Independence Score), which is suggested by “Richard Rojeck” in his paper “Financial Independence Score”, and is also patented under his name [7, 8]. This thesis is an implementation of the concept of FIScore on an online platform. This online user interface will calculate the FIScore by taking inputs from users for his/her age, current earnings, savings, investments etc. based on which it will predict how far or close a person is from achieving his/her financial independence.

This book is organized into six chapters. Chapter 1 is Introduction section, introducing the concept. The importance and background about the concept of FIScore is discussed in Chapter 2. Chapter 3 briefly describes the technology used to build the project. The algorithm used to calculate the score and its implementation is given in Chapter 4.
Chapter 5 concludes with the test cases and the final results followed by future enhancements.
CHAPTER 2

INTRODUCTION TO FISCORE

Various kinds of online calculators are available in the market for users to calculate their future earnings or retirement benefits. These calculators can range widely in the savings that they recommend for instance, from 9 percent of a person's pay to as much as 70 percent. Some of the calculators are either too difficult to operate, very lengthy, take too long to calculate, produce confusing results or produce required contribution amounts that appear either too low or too high. This makes it hard for people to understand how much they need to save for retirement. They get divergent advice even though they are using the same numbers [9].

To make it easier for a layperson to understand this concept, Richard Rojeck came up with an idea in his book about Financial Independence Score, which is also patented in his name. He is a CFP professional and graduate in MBA from San Diego State University and holds a B.S. degree in Business Administration from Oregon State University. He is also a member of the Financial Planning Association (FPA). He serves on the board of the CFP® Board of Standards. Locally, he serves on the gift planning advisory board of the University of California, San Diego.

In the following sections I will discuss in detail about this score, the significance of calculating it and how to calculate it. Later I will discuss the application developed here, which aims at implementing this idea on an online platform for users who have difficulties operating calculators online.

This application is a kind of an online calculator, which is intended to be very simple, has an intuitive interface, is easy to use, and only asks for inputs that are possible for a layperson to answer without having to do too much research. It gives them an idea of their financial status without going to financial experts or advisors.
2.1 WHAT IS FINANCIAL INDEPENDENCE SCORE?

We briefly discussed about Financial Independence in Chapter 1. Financial independence mean different to different people. For some people, it might simply mean never having to worry about bills again, knowing that they will always have a comfortable home and the time and resources to enjoy their interests and hobbies. For many, it means not having to work a second job, or for some, financial independence means just having sufficient income so their spouse could stay home with the children. The question to ask is what does financial independence means to every individual person. If one knows the answer to that question, then the next thing is to determine what financial independence will cost and what one must do to achieve it. In order to figure out answers to these questions we need to understand some terms and concepts related to finance [10]. The first term is Future Value, which can be defined as the worth of a sum of money in the future, accounting for time and the impact of inflation. It means that value of money fluctuates over a time period: Today an amount of $1000 might not be worth $1000 in next 10 years. This fluctuation is caused due to inflation. Inflation describes a rise in price of the goods and services over a period of time, which results as the reduction of the purchasing power of a currency.

The chart in Figure 2.1 indicates the rate with which the inflation increased and decreased based on Consumer Price Index in last 10 years (ranging from 2003-2013). This data is provided by the U.S. Department of Labor and Bureau of Labor Statistics [11].

![Annual Inflation Rates Chart (2003-2013)](image_url)

Figure 2.1. Inflation rates (2003-2013).
Looking at the graph in Figure 2.1 it can be noted that inflation rate in U.S. has increased at an average rate of 3% yearly over the last 10 years, which is relatively low. Let’s take an example. For instance, you defined financial independence as $100,000 after income tax, per year, at age 60 and you are currently 40 years old. While $100,000 is the Present Value (a future amount of money that has been discounted to reflect its current value, as if it existed today) you would need to determine the Future Value, which would be a function of the rate of inflation over those intervening 20 years. Assuming the inflation rate grows at an average rate of 3% annually for those 20 years, Present Value of $100,000 will be $180,611 in Future Value*. To calculate this value Table 2.1 can be used.

Table 2.1. Future Value Factors (Based on 3% Rate)

<table>
<thead>
<tr>
<th>Years to Objective</th>
<th>Factor</th>
<th>Years to Objective</th>
<th>Factor</th>
<th>Years to Objective</th>
<th>Factor</th>
</tr>
</thead>
<tbody>
<tr>
<td>40</td>
<td>3.262</td>
<td>28</td>
<td>2.288</td>
<td>16</td>
<td>1.605</td>
</tr>
<tr>
<td>39</td>
<td>3.167</td>
<td>27</td>
<td>2.221</td>
<td>15</td>
<td>1.558</td>
</tr>
<tr>
<td>38</td>
<td>3.075</td>
<td>26</td>
<td>2.157</td>
<td>14</td>
<td>1.513</td>
</tr>
<tr>
<td>37</td>
<td>2.985</td>
<td>25</td>
<td>2.094</td>
<td>13</td>
<td>1.469</td>
</tr>
<tr>
<td>36</td>
<td>2.898</td>
<td>24</td>
<td>2.033</td>
<td>12</td>
<td>1.426</td>
</tr>
<tr>
<td>35</td>
<td>2.814</td>
<td>23</td>
<td>1.974</td>
<td>11</td>
<td>1.384</td>
</tr>
<tr>
<td>34</td>
<td>2.732</td>
<td>22</td>
<td>1.916</td>
<td>10</td>
<td>1.344</td>
</tr>
<tr>
<td>33</td>
<td>2.652</td>
<td>21</td>
<td>1.860</td>
<td>9</td>
<td>1.305</td>
</tr>
<tr>
<td>32</td>
<td>2.575</td>
<td>20</td>
<td>1.806</td>
<td>8</td>
<td>1.267</td>
</tr>
<tr>
<td>31</td>
<td>2.500</td>
<td>19</td>
<td>1.754</td>
<td>7</td>
<td>1.230</td>
</tr>
<tr>
<td>30</td>
<td>2.427</td>
<td>18</td>
<td>1.702</td>
<td>6</td>
<td>1.194</td>
</tr>
<tr>
<td>29</td>
<td>2.357</td>
<td>17</td>
<td>1.653</td>
<td>5</td>
<td>1.159</td>
</tr>
</tbody>
</table>

Based on the table, you need to multiply the factor corresponding to the number of years until your goal by your current year’s goal. For example, the factor for 20 years is 1.806 and multiplying it by $100,000 yields the $180,600 mentioned above. Thus a range of income values can be projected based on the factors provided in Table 2.1 to show the impact on the FI income.

The graph in Figure 2.2 [7] projects the rate of increase in Future Value with respect to change in inflation rate over a period of time and how it will impact the FI income objective.

Now that we have computed and projected the Future Value, we need to determine the amount of invested capital needed to generate the $180,611 amount per year, accounting for the ongoing impact of inflation, for the rest of your life. To find this out we need to
determine what is the Present Value of the income and the Discount Rate, which can be derived from the assumed rate of return on your invested capital. In doing so you will know what sum of money, when invested, will generate the $180,611 annually, adjusted for inflation. Considering the same example, let’s assume investments could earn 6% after tax then. This will be the Discount Rate. After you have calculated this, you will need to decide whether you would like to use the endowment approach (i.e. desire to preserve the capital) or the annuity approach (i.e. desire to consume the capital). Below is methodology to calculate it both ways.

Using the above example of a $100,000 goal, you would divide the $100,000 by $10,000 since the table is per $10,000 of desired income. Then multiply the result, 10 in this case, by the corresponding factor, for 20 years (refer to Table 2.1). That yields our result of $3,901,200 for endowment. If you elect the annuity approach, it will yield $2,708,490. Figures 2.3 and 2.4 show two tables for endowment and annuity, which helps to do the calculations.

So, we conclude that $3,901,200 endowment or $2,708,490 annuity generates $180,611 adjusted for inflation.

Figure 2.2. Impact of inflation on FI. Source: R. ROJECK, The financial independence, the essential guide. Unpublished manuscript, n.d.
Some terms and concepts were described above, which help to determine how one can set a goal for financial independence. Below is a description of how the concept of your Financial Independence Score of FIScore™ works.

FIScore is comprised of two concepts:

\[
\text{F.I.Score} = \text{Capital Ratio} + \text{Savings Ratio} \tag{1.1}
\]

1. **Capital Ratio**: The Capital Ratio represents the amount of capital you have to provide for your financial independence compared to how much you should have. The closer your Actual Capital is to the Required Capital, the better off you are.
Capital Ratio = \frac{\text{Present Value of Actual Capital}}{\text{Present Value of Required Capital}} \tag{2.2}

a. *Actual Capital*: Actual Capital represents your liquid money and assets, which can be invested after accounting for applicable income taxes, including the present value of vested accrued benefits of pension plans, social security and other benefits.

b. *Required Capital*: Required Capital refers to the capital needed when compounded at the appropriate rate to the desired financial independence date.

If your capital ratio is .50, then you’re halfway there. If your ratio is 1.50 then you have more than you’ll need. The minimum score on the Capital Ratio is zero; there is no maximum score.

2. **Savings Ratio**: The Savings Ratio tells you how much you should be saving to reach your financial independence objective, if you’re not already there (i.e. have a Capital Ratio of 1 or higher).

\[
\text{Savings Ratio} = \frac{\text{Actual Annual Savings}}{\text{Required Annual Savings}} \tag{2.3}
\]

   a. Where,

   \textit{Actual Annual Savings} is the total of personal and employer contribution to all savings and investment vehicles.

   \textit{Required Annual Savings} is the annual savings that when compounded at the appropriate rate to the desired financial independence date and added to the future value of the Actual Capital will equal the future value of the Required Capital.

   The minimum score is zero; there is no maximum score.

For example: If your Savings Ratio is .50, you’re currently saving only 50% of what you should be in order to meet your goal. A ratio of 1.0 means you’re right on track, and if your ratio is above 1.0, your savings are in excess of what’s needed and will, if continued, assure you of achieving your objective with some wealth to spare.

Thus FIScore is computed as follows:

\[
\text{FIScore}^{TM} = \frac{\text{Present Value of Actual Capital} + \text{Present Value of Actual Annual Savings}}{\text{Present Value of Required Capital}} \tag{2.4}
\]

The purpose of this thesis is to implement this idea. An algorithm is devised that will perform the computation and we can calculate a person’s Financial Independence Score (F.I.score). It will calculate this score based on a lot of inputs from the user and some
precalculated values. The final goal is to publish the method online over the Internet, where a person will be able to access his/her status towards his/her financial independence i.e. he/she will be able to determine if one has achieved his/her FI, or will achieve the FI at his/her desired age with current saving practices or still has a long way to go.
CHAPTER 3
TECHNOLOGIES USED

The objective of creating this online application is to provide a simple interface for the user where they can evaluate their financial status free of cost. Therefore, the main objective is to keep it intuitive and user friendly. Below is a brief discussion about the technologies and languages used to develop the project followed by the description about language used for building the project.

- XAMPP is used as a local web server to run PHP pages, create and manage databases.
- The application is developed using PHP, as it is an open source software and platform independent and works faster on Internet.
- For database, MySQL is used as it works great in coordination with PHP.
- MatLab is used to implement the algorithm and perform computations to check the results of the inputs.

3.1 XAMPP

XAMPP is an open source cross-platform web server solution. It provides a platform for website designers and programmers to test their websites or web pages on their computers without any access to the Internet and before they can upload their applications on actual servers [12].

XAMPP has the most common web development technologies in a single package that consists of the following:

- X (to be read as "cross", meaning cross-platform)
- Apache HTTP Server
- MySQL
- PHP
- Perl

This section will discuss the concept of setting up the development environment, installation and configuration process of the XAMPP Apache distribution, and then provide a guide to
start developing the program using the PHP programming language and MySQL database package.

3.1.1 Installing XAMPP on MAC OS

It is a free package available online for downloading. After you find the version you want, download the self-extracting ZIP archive (ZIP files are different for mac and windows users). Then run and extract the contents into a root directory, in this case Application folder of mac. Go to the application folder and click the XAMPP folder. Inside the XAMPP folder you will find XAMPP control panel, which helps to start the servers installed as a part of XAMPP. Start Apache and MySQL by clicking on the "Start" buttons next to each item. Go to http://localhost/. If you are directed to a page with the XAMPP logo, your installation was successful. You can add or change the files in /Applications/xampp/htdocs to change what you see at http://localhost/ on any local web browser. Now you are ready to write web pages.

3.1.2 Writing PHP Files

In a text editor, such as TextPad, write the following lines of code in PHP:

```php
<html>
<head><title>Hello World</title>
</head>
<body>
<p><?php echo "Hello World";?></p>
</body>
</html>
```

In order to run and test this PHP program, save it into your xampp\htdocs directory with the filename of helloWorld.php. Then, to view it in your browser, simply type in http://localhost/helloWorld.php into the address bar. This will print “Hello World” on the webpage.

3.1.3 Creating a Database and a Table

The XAMPP contains an application called phpMyAdmin, which allows developers to administer and maintain MySQL databases. Along with Apache and MySQL running in the background, type http://localhost/phpMyAdmin/ into your Internet browser. If you are successful in doing so it will start the phpMyAdmin.
You will have a window like in the Figure 3.1 and you can start creating the tables and databases, details regarding creating tables and databases are discussed in the later sections.

![Figure 3.1. phpMyAdmin webpage.](image)

### 3.2 PHP

PHP is a HTML-embedded scripting language generally used for web development. It stands for "Hypertext Preprocessor". It is a widely used open source server-side scripting language which run on web servers and allows web developers to collect form data, send and receive cookies, and write dynamically generated pages quickly. PHP is available free of cost under PHP General Public License [13].

It was developed by Rasmus Lerdorf in 1984 to maintain his personal homepage and he wrote a series of Common Gateway Interface (CGI) Perl scripts in C programming language and named it “Personal Home Page Tools” [14]. He later rewrote these tools to create larger and richer implementation. This was done to improve performances and extending them to add the ability to work with web forms and to communicate with databases. Since then many versions of PHP has been released with improvements and added functionalities.

PHP allows developers to write simple code or script in php, which is executed, on the server. Once the web server has executed the PHP code embedded in a web page the result takes the place of the PHP code in the page, which are then sent to the client. The
client would receive the results of running that script, but would not know what the underlying code is [15].

There are many advantages of using PHP for web development. Some of them are demonstrated below:

- It is platform independent and therefore it can run on Windows Linux or Mac servers.
- It is available with documentation in many languages. Therefore, it is easy to learn compared to many other scripting languages. It has a syntax that is easy to parse and is human-friendly.
- Lots of hosting services have it ready to use, no special configuration. Other web-based tools are pretty easy to access through PHP i.e. google maps, etc.
- One of the strongest and significant features in PHP is its support for a wide range of databases.
- It runs faster on the Internet and easily integrates AJAX, Callback etc. Interfaces are very easily implemented with Apache/MySQL.

PHP scripts aren’t just used for server side scripting. They can be also be used for:

- Command line scripting. You can make a PHP script to run it without any server or browser. You only need the PHP parser to use it this way. These scripts can also be used for simple text processing tasks. See the section about Command line usage of PHP for more information.
- Writing desktop applications. PHP is probably not the best language to create a desktop application with a graphical user interface, but if you know PHP very well, you can use some advanced PHP features in your client-side applications. You also have the ability to write cross-platform applications this way.

All the important factors listed above were the reason to choose PHP for the online implementation. Below we discuss the various PHP features used in the development of the software. The following demonstrates the form handling in PHP. Below is the code snippet of how a PHP code looks like.

```html
<html>
  <form action="welcome.php" method="post">
    Name: <input type="text" name="fname">
    Age: <input type="text" name="age">
    <input type="submit">
  </form>
</html>
```
We now discuss the attributes. The form has an attribute ‘action’. This is where we specify where the form data goes when the user hits submit. Like in the example above, action has a value “welcome.php” which indicates that when the form is filled and the user hits submit the form data is sent to a file called “welcome.php”.

The form has a second attribute that is method=”post”. In PHP, the form data can be sent using two methods GET and POST. Information sent from a form with the GET method is visible to everyone and should not be used when security is a concern as the variables are displayed in the URL. Therefore, this shouldn’t be used when one is dealing with sensitive information or passwords. It also has constraints on the amount of information to send. The predefined $_GET variable in PHP is used to collect values in a form with method="get". In contrast to GET method, information sent from a form with the POST method is invisible to others and there is no limit to data sent using this method. The predefined $_POST variable is used to collect values in a form with method="post".

There are times when you need to check the data that you sent through forms. For example, if the user is required to input an integer value, the form should put a check or prompt the user and not allow non-integer values. This is called form validation and PHP allows form validation. The code below demonstrates a simple example of form validation using a function:

```php
function check_input($data)
{
    $data = trim($data);
    $data = stripslashes($data);
    $data = htmlspecialchars($data);
    return $data;
}
```

The function above takes the data passed to it, strips unwanted characters (extra space, tab, newline) from the beginning and end of the data using the PHP trim() function, strips any quotes escaped with slashes using stripslashes() function and passes it through htmlspecialchars() function, which replace HTML chars like < and > to their HTML version &lt; and &gt;.

The function can be called in the program in the following way:

```php
<?php
    $yourname = check_input($_POST['fname']);
?>
```
The $_POST['fname'] is the value from the form described above. The ‘$yourname’ is PHP variable, which starts with $ sign followed by the name of the variable and they can hold values. Variables in PHP are case sensitive. Variables also have scope. The scope of a variable is the part of the script where the variable can be referenced or used. They have four different kinds of scopes: Local, Global, Static and Parameter. A variable defined inside a PHP function can only be accessed within that function and the variable is said to have a Local scope. And a variable defined outside a function can be accessed from anywhere and has Global scope.

PHP has a special type of variable called arrays. It can store multiple values in a single variable. There are three types of arrays in PHP:

1. **Indexed arrays** - Arrays with numeric index.
2. **Associative arrays** - Arrays with named keys
3. **Multidimensional arrays** - Arrays containing one or more arrays

And last but not the least PHP can also be used to connect to the database using mysql_connect() function. The following is the syntax to open a connection to the MySQL server (discussed in the next section):

```
mysqli_connect(host,username,password,dbname);
```

where, host is host name or the IP address of the database we want to connect to, username is the user name of MySQL, password to login into the database and dbname is the default database name. Once we establish a connection to the database, we can fire queries. Database and queries are discussed in the next section.

### 3.3 MYSQL

MYSQL is an open source relational database management system (RDBMS) that runs as a server providing multi-user access to a number of databases. The SQL part of “MySQL” stands for “Structured Query Language.” SQL is the most common standardized language used to access databases and is defined by the ANSI/ISO SQL Standard [16]. Its source code is available under the terms of the GNU General Public License, as well as under a variety of proprietary agreements [17].

MySQL is the most widely used relational database today not because it is free but because it is very powerful. It was developed to manage large volumes of data at very high
speed to overcome the problems of existing solutions. It can be used for verity of applications but it is mostly used for the web applications on the Internet. All the fast-growing organizations including Facebook, Google and Adobe rely on MySQL.

MySQL database is capable of storing any type of data that you want. You can quickly store and retrieve information using SQL statements. It provides a very high performance and it is multi threaded and multi user RDBMS.

Important Features:
1. Written in C and C++ language.
2. Fast and reliable for any type of application
3. Lightweight application.
4. Its command line tool is very powerful and can be used to run SQL queries against database.
5. Supports indexing and binary objects.
6. Fast thread-based memory allocation system.
7. Stored procedures, Triggers and Cursors

One of the best and most popular GUI’s for managing a MySQL database is called phpMyAdmin, which is used in developing this online interface [11]. It is a web-based application that makes it easy to manage your MySQL database. phpMyAdmin will let you add, remove and manage databases, tables, and entries; backup the database, and run specific SQL queries. To see how we can create a databases/tables, insert data into tables, and select data from the tables consider the Table 3.1 as an example:

<table>
<thead>
<tr>
<th>P_id</th>
<th>LastName</th>
<th>FirstName</th>
<th>Address</th>
<th>City</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Pitt</td>
<td>George</td>
<td>Long Beach</td>
<td>Los Angeles</td>
</tr>
<tr>
<td>2</td>
<td>Peterson</td>
<td>Jack</td>
<td>Mira Mesa</td>
<td>San Diego</td>
</tr>
<tr>
<td>3</td>
<td>Summers</td>
<td>Mary</td>
<td>Alvarado Rd</td>
<td>New York</td>
</tr>
</tbody>
</table>

The CREATE TABLE statement is used to create a table in a database. We will create a table named Persons which will have columnname P_id, LastName, FirstName, Address and City. The SQL syntax to create the table is:

```sql
CREATE TABLE Persons
(
    P_id int,
    LastName varchar(255),
    FirstName varchar(255),
```
This will create an empty table as shown in Table 3.2.

### Table 3.2. Example of CREATE Statement

<table>
<thead>
<tr>
<th>P_id</th>
<th>LastName</th>
<th>FirstName</th>
<th>Address</th>
<th>City</th>
</tr>
</thead>
</table>

After creating the table we will start adding data to it. To insert data into this table use the INSERT INTO statement like this:

```
INSERT INTO Persons (P_Id, LastName, FirstName, Address, City)
VALUES (1, 'Pitt', 'George', 'Long Beach', 'Los Angeles')
```

This will add data to the empty table as shown in Table 3.3. Similarly we can add other values also.

### Table 3.3. Example of INSERT Statement

<table>
<thead>
<tr>
<th>P_id</th>
<th>LastName</th>
<th>FirstName</th>
<th>Address</th>
<th>City</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Pitt</td>
<td>George</td>
<td>Long Beach</td>
<td>Los Angeles</td>
</tr>
</tbody>
</table>

Once you add data to the table you can view it by using The SELECT statement like this:

```
SELECT LastName, FirstName FROM Persons
```

This will give the output shown in Table 3.4.

### Table 3.4. Example of SELECT Statement

<table>
<thead>
<tr>
<th>LastName</th>
<th>FirstName</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pitt</td>
<td>George</td>
</tr>
<tr>
<td>Peterson</td>
<td>Jack</td>
</tr>
<tr>
<td>Summers</td>
<td>Mary</td>
</tr>
</tbody>
</table>

In these examples, the methodology to create tables, insert data and access rows and columns using SQL statements was demonstrated. There are various other SQL statements and operations that can be used to access tables and manipulate the data that it contains.
3.4 MATLAB

MATLAB is a high-level language, which stands for MATrix LABoratory, which provides environment for numerical computation, visualization, and programming. It is developed by MathWorks and it is in written in C and Java. It is built around matrices and vectors [18]. Using MATLAB, you can perform matrix manipulations, plotting of functions and data, implementation of algorithms; you can analyze data, develop algorithms, and create models and applications [19]. It is used in academic and research institutions and across various industries.

It is a weakly typed language. The variable types are implicitly converted and variable doesn’t need type declaration, which makes it a dynamically typed language. MATLAB involves writing MATLAB code into the Command Window (as an interactive mathematical shell), or executing text files containing MATLAB code and functions.

MATLAB supports object-oriented programming that includes classes, inheritance, virtual dispatch, packages, pass-by-value semantics, and pass-by-reference semantics. It also supports GUI features for developing applications. This includes graph-plotting features and etc. [19].
CHAPTER 4

DESIGN AND IMPLEMENTATION

The user inputs the following information, which is divided into 3 sections. Some of the data that is not specified by the user are set to the default values. Variables with no default values are mandatory fields. There is a brief description of the list of variables used here at the start. All the variables are 6 letters for consistency reasons [20].

4.1 USER INPUTS

1. **User Information**: This section takes user’s current age, his annual income and the current earnings, what is the rate for your growth. It also asks at what age the user would like to become financially independent and how many years the user still may want to work after achieving it. And that what will he/she do with those savings: would he/she like to invest it further or spend it, or he/she would like to save it. Figure 4.1 displays the design used for the form. It displays the input fields and the variables associated with it.

![Figure 4.1. Structure for user information.](image)

We discuss briefly as to what user will input for the following variable:

- **AgeTod**: For this, user enters his/her current age. It should be a 2-digit integer i.e. it cannot be a zero value and it should be less 100. There are two fields to fill although
the second filed is optional. The second field is provided in case the user wants to calculate his FI Score with his/her spouse (AgeTod1 and AgeTod2 respectively).

- **AgeFin**: This asks for the user’s desired age of FI, which should be greater than his current age and less than 100 (AgeTod < AgeFin < 100). Also, the current age should be less than the desired age of FI.

- **GenUse**: This specifies the user’s gender. It is a Boolean value. For male, enter 1 and for female enter 2. If no gender is specified, then the default value $GenUse = 0$.

- **IncFin**: For this, the user should enter his desired after-tax annual income at FI in today’s dollars.

- **PreCap**: This is where the user specifies if he/she desires to preserve or consume the investment capital. It is also a Boolean variable because the user will either preserve or consume. To preserve, the user should enter 1 and 2 if he/she wishes to consume.

- **IncTod**: This inputs user’s current annual income before taxes i.e. his/her current earnings minus the tax. The user can enter an estimate as doesn’t have to be an exact value.

Note: The more accurate the estimation is the more accurate will be the FI Score.

- **IncGro**: For this the user has to estimate his annual income growth rate (for the first year).

- **YeaWor**: This is the number of years the user wishes to work after he/she has achieved his/her FI. For validation purposes, the value should range between 1-25 years.

- **PerInc**: This is the users’ estimated annual income during financial independence.

2. **Personal Investment**: This section takes the user’s savings after paying his taxes on his current earnings. This is an important factor that helps to determine how much more he can invest so that he will still save and achieve FI at his desired age. So the user should try to input value closer to the actual value (see Figure 4.2).

- **FinSav**: It has two fields FivSav1 and FivSav2. In this, the user should enter the current value of FI savings. Calculations to compute FI savings were shown in Chapter 2.

- **AnnBas**: In finance theory, an annuity is a terminating "stream" of fixed payments, i.e., a collection of payments to be periodically received over a specified period of time. The valuation of such a stream of payments entails concepts such as the time value of money, interest rate, and future value. The user calculates his annuity and enters that value.

- **SavFin**: For this, the user should enter his/her current annual financial independence savings as a percentage of incomes. It will be a decimal value.

3. **Retirement Accounts**: Figure 4.3 shows the structure for retirement accounts.
**Figure 4.2.** Structure for personal investment.

**Table:**

<table>
<thead>
<tr>
<th>Personal Investment</th>
<th>Non-Annuities</th>
<th>Annuities</th>
</tr>
</thead>
<tbody>
<tr>
<td>Current balances</td>
<td>FinSav(1)</td>
<td>FinSav(2)</td>
</tr>
<tr>
<td>Annuity basis</td>
<td></td>
<td>AnnBas</td>
</tr>
</tbody>
</table>

**Figure 4.3.** Structure for retirement accounts.

- **AssAll:** This represents the percentage of assets the user owns. Assets include Equity, Bonds, Real Estate, Municipal and Treasury bonds.
- **OthAss:** In this, the user will input if there are other assets that will be available for him/her in the future i.e. for FI and input the value for those assets.
- **EmpCon:** User inputs his current annual employer contributions as a percentage of income.
- **BenFin:** For this, the user inputs his/her estimated annual financial independence benefits as percentage of income.
- **SocBen:** For this, the user inputs his/her Social Security benefits during FI if he/she is eligible for Social security benefits. You can calculate your Social security benefits online on Social Security site.
- **TaxRat:** This specifies the user’s income tax bracket. Default income tax rate is $\text{TaxRat} = 30\%$. 

4.1.1 Forecasted Values

As we discussed in the previous chapter the future inflation rates and investment and returns like returns of the S&P 500 Index, returns of Aaa corporate bonds, returns of U.S. T-bills, returns of real estate, and return of municipal bonds play an important part in the calculation of the FIScore. We will now discuss how these can be simulated. We obtained Historical data for these from [21-26]. This historical data is updated each year and is replaced with new data. Preliminary examination of the historical data suggests that returns of the S&P 500 Index and real estate follow a Normal probability distribution [27], while inflation rates, Aaa corporate bond returns, and returns of U.S. T-bills follow Gamma probability distributions [28]. The distribution of the municipal bond returns is inconclusive but we are going to model it as a standard distribution. We can also observe a strong correlation between the latter three time series. Following are the six variables to be simulated based on the discussions above for the next $YeaTot$ (discussed above) years:

1. **InfInt**: Forecasted Inflation rates
2. **EquInt**: Forecasted Returns of the S&P 500 Index
3. **BonInt**: Forecasted Returns of Moody's Seasoned Aaa Corporate Bond
4. **TreInt**: Forecasted Returns of U.S. T-bills
5. **ReaInt**: Forecasted Returns of real state

---

1. The Standard & Poor's 500 Index (S&P 500) is a widely recognized, unmanaged index of common stock prices. The index's total returns include the reinvestment of dividend and capital gain distributions, but are not adjusted for any income taxes payable by shareholders on these distributions.

2. Moody's Seasoned Aaa Corporate Bond Yield is a measure of the average cost of borrowing for companies with the highest bond ratings.

3. Treasury bills (T-bills) are fixed-income instruments of very short maturity issued by the federal government. Because T-bills are issued with the full faith and credit of the U.S. government, there has never been a year in which an investment in them would have yielded a negative result. This full faith and credit applies only to the timely payment of principal and interest, and does not eliminate market risk.

4. A real estate investment trust (REIT) is a real estate company that offers common shares to the public. In this way, a REIT stock is similar to any other stock that represents ownership in an operating business. But a REIT has two unique features: its primary business is managing groups of income-producing properties and it must distribute most of its profits as dividends.

5. Municipal bonds are debt securities that states, cities, counties, and other governmental entities issue to raise money for public purposes—such as building schools, highways, hospitals, sewer systems, and other special projects. A primary feature of many municipal securities is that the interest you receive is generally exempt from federal income tax. The interest may also be exempt from state and local taxes if you live in the state where the bond is issued.
6. **MunInt**: Forecasted Returns of municipal bonds

To see how these are simulated and calculated refer to [20]. Once we have forecasted the values for the above variables **InfInt, EquInt, BonInt, TreInt, ReaInt** and **MunInt** these values are then stored into the MySQL database in a table (named forecasted) and extracted later to compute the Financial Independence Score. Each forecasted variable is an array and contains three values for each of the variable declared. The table has separate rows for each value and the values; are decimal values therefore we have assigned them float. The structure for this looks like what is shown in Table 4.1.

<table>
<thead>
<tr>
<th>FIELD NAME</th>
<th>NULL</th>
<th>TYPE</th>
</tr>
</thead>
<tbody>
<tr>
<td>InfInt1</td>
<td>NOT NULL</td>
<td>FLOAT(5)</td>
</tr>
<tr>
<td>InfInt2</td>
<td>NOT NULL</td>
<td>FLOAT(5)</td>
</tr>
<tr>
<td>InfInt3</td>
<td>NOT NULL</td>
<td>FLOAT(5)</td>
</tr>
<tr>
<td>EquInt1</td>
<td>NOT NULL</td>
<td>FLOAT(5)</td>
</tr>
<tr>
<td>EquInt2</td>
<td>NOT NULL</td>
<td>FLOAT(5)</td>
</tr>
<tr>
<td>EquInt3</td>
<td>NOT NULL</td>
<td>FLOAT(5)</td>
</tr>
<tr>
<td>BonInt1</td>
<td>NOT NULL</td>
<td>FLOAT(5)</td>
</tr>
<tr>
<td>BonInt2</td>
<td>NOT NULL</td>
<td>FLOAT(5)</td>
</tr>
<tr>
<td>BonInt3</td>
<td>NOT NULL</td>
<td>FLOAT(5)</td>
</tr>
<tr>
<td>TreInt1</td>
<td>NOT NULL</td>
<td>FLOAT(5)</td>
</tr>
<tr>
<td>TreInt2</td>
<td>NOT NULL</td>
<td>FLOAT(5)</td>
</tr>
<tr>
<td>TreInt3</td>
<td>NOT NULL</td>
<td>FLOAT(5)</td>
</tr>
<tr>
<td>ReaInt1</td>
<td>NOT NULL</td>
<td>FLOAT(5)</td>
</tr>
<tr>
<td>ReaInt2</td>
<td>NOT NULL</td>
<td>FLOAT(5)</td>
</tr>
<tr>
<td>ReaInt3</td>
<td>NOT NULL</td>
<td>FLOAT(5)</td>
</tr>
<tr>
<td>MunInt1</td>
<td>NOT NULL</td>
<td>FLOAT(5)</td>
</tr>
<tr>
<td>MunInt2</td>
<td>NOT NULL</td>
<td>FLOAT(5)</td>
</tr>
<tr>
<td>MunInt3</td>
<td>NOT NULL</td>
<td>FLOAT(5)</td>
</tr>
</tbody>
</table>

**Table 4.1. Structure for Table Forecasted**

4.1.2 Precalculated Values

These values are calculated based on the user’s input. These can be demonstrated as follows as to what they compute:

- **YeaFin**: This calculates the number of years left until desired financial independence. It is a 2-digit integer specifying the years. It is calculated by subtracting the current age of the user from the age he decides to achieve his FI. Thus, the following can be deduced:

\[
YeaFin = AgeFin - AgeTod
\]  

(4.1)
**AgeDea**: This calculates the user’s estimated age of death \(^6\). This is also a 2-digit integer, which specifies age. While calculating these following variables we assume: If the user inputs zero i.e. the default case (Case GenUse = 0) then the value of AgeDea = 78 years is assumed (Life expectancy at birth total population: 77.85 years). If the users inputs 1 then value of AgeDea = 75 is assumed (Life expectancy at birth of a male: 75.02 years) and AgeDea = 81 if the user inputs 2 (Life expectancy at birth of a female: 80.82 years)

**YeaDea**: This calculates the number of years from the year of financial independence until death. To calculate this we need to first calculate the AgeDea, which we just calculated above and we need to have the value for AgeFin. The difference of between these two variables will give the value of YeaDea. Below is the expression to calculate the value:

\[
YeaDea = AgeDea - AgeFin
\]  

(4.2)

**YeaTot**: This calculates the total number of years for forecasting purposes (discussed above). This is the sum of YeaDea and YeaFin and can be expressed as:

\[
YeaTot = YeaFin + YeaDea
\]  

(4.3)

**IncFut**: This is the user’s future annual income before taxes are updated. User has to input his estimated annual growth rate and his current earnings for himself /herself and his/her spouse if the user is finding the FIScore as a couple.

**FutBen**: It calculates the user’s future benefits during FI, which depends upon the forecasted values, which are discussed above.

### 4.2 Implementation

This application is a user interface created to allow user to go online and calculate their FIScore. The webpage is created using PHP and it looks like as shown in Figure 4.4.

### 4.3 Examining the Cases

**Case 1**: Lets see meet José, age 28 and single. He is the middle of five children of Mexican emigrants, but is a U.S. citizen, having been born in the United States. José served six years in the U.S. Army. He currently earns $40,000 annually. The company provides a 401(k) retirement plan with a liberal matching contribution as well as health and disability benefits. José is very thrifty, contributes the maximum to the plan, but because of concern

---

\(^6\) This entry contains the average number of years to be lived by a group of people born in the same year, if mortality at each age remains constant in the future. The entry includes total population as well as the male and female components.
## Online FIScore

### User Information

- Enter Your Current Age: [ ] User 1 [ ] User 2
- Gender: 1 for Male, 2 for Female or default: [ ]
- At what age would you like to become financially independent: [ ] yrs
- What amount of annual income would you like during FI (after tax): [ ] $ [ ] $
- What are your current earnings for both User 1 & User 2 (Before taxes): [ ] $ [ ] $
- What income growth should be used (Enter both if completing as a couple): [ ] [ ]
- How many Years will you work past FI (Enter both if completing as a couple): [ ] yrs [ ] yrs
- What % of current earnings do you expect (Enter both if completing as a couple): [ ] [ ]
- Do you wish to preserve or consume your assets: [ ] Preserve [ ] Consume

### Personal Investments

- Current Balances: [ ] $ [ ] $
  *(Non-Annuites & Annuities)*
- Annuity Basis: [ ]
- Annual Savings as % of income: [ ] [ ]
  *(Non-Annuites & Annuities)*
  User 1: [ ] User 2: [ ]

### Retirement Accounts

- Current Balances: [ ] $ [ ] $
  *(Enter both if completing as a couple)*
- User 1(Roth) [ ] User 1(401k) [ ]
- User 2(Roth) [ ] User 2(401k) [ ]
- Annual savings as % of income: [ ] [ ]
  *(Enter both if completing as a couple)*
- User 1(Roth) [ ] User 1(401k) [ ]
- User 2(Roth) [ ] User 2(401k) [ ]
- Asset Allocation: [ ]
  *(As a percent of portfolio)*
- Equities: [ ]
  Bonds: [ ]
  Treasury: [ ]
  RealEst: [ ]
  Municipal: [ ]
- Other Assets that will be available for your FE: [ ]
  *(after tax in future dollars)*
- Employer Contributions: [ ] [ ]
  *(Enter both if completing as a couple)*
- User 1: [ ] User 2: [ ]
- If participant in a defined benefit pension plan, what % of your income will it pay you upon retirement:
- User 1: [ ] User 2: [ ]
- Are you eligible for Social Security Benefits:
  - YES [ ]
  - NO [ ]
- Tax Rate: [ ]
  *(household tax rate if completing as a couple)*

![Figure 4.4. Snapshot of the form.](image)
about the stock market, has allocated his contributions 50% to a money market fund and 50% to a bond fund. Currently, José rents an apartment, but is saving for a down payment on a house. He avoids debt and maintains no credit card balances. José’s FIScore™ input sheet appears as follows. José’s FIScore™ is 0.432.

These inputs were calculated and then tested on two different platforms to check the result’s accuracy. We used MATLAB and PHP and both computed and produced same results. A FIScore™ of 1 or more indicates that your current capital and projected savings together are sufficient to achieve your financial independence goal whereas a FIScore™ of less than 1 indicates that your capital and projected savings together are insufficient to achieve your FI goal. For instance in the case above he is almost halfway in achieving his FI goal. Obviously if you alter any of the inputs to the calculation, such as not actually saving at the rate you projected, a recalculated or future FIScore™ will be different. The FIScore™ can range from 0 to 1 (or more) depending on the input by the user for the calculation.

4.4 CONCLUSION

In this thesis we have discussed what FI is and how the user calculate a score towards achieving his/her FI. You input a few assumptions into the calculator and it provides the user with a score and provides you a little explanation. The FIScore that we calculate does appear scientifically and mathematically precise but it is just an approximation and isn’t perfect. It is based on factors like retirement age, life expectancy, inflation, investment return, portfolio size, and expected retirement expenses whose dynamics change over time and is also dependent on the input by the users which are also assumptions. Inputting incorrect values will result in a critical mistake in calculating the FIScore. The output is only as accurate as the assumptions used for input.

It is just a combination of math and computations and a set of rules that it follows. Discussed below are a few shortcomings in the estimated values considered for the calculations.

4.5 SHORTCOMINGS

The critical factor to determining the accuracy of the FIScore estimate is not the calculator used, but the assumptions used by the calculator. For example, if we consider the
investment return assumption, the conventional wisdom is that the future investment returns will relate in some way to historical investment return and that is what we are doing: forecasting the rate with which the investment return will be affected and using those values in the calculation. Whatever has happened in the past is what you should expect in the future. So, if the future investment returns resemble the past, then they will all be roughly correct because they are based on the same assumptions. But, if future investment returns are significantly different from the past, then they will all be wrong regardless of how sophisticated the algorithm appears on the surface.

Another example of a flawed assumption is estimating an individual life expectancy because nobody knows when he or she will die. We use actuarial tables to estimate an individual life expectancy but it is a fundamentally flawed assumption because the process is only accurate for large numbers. These tables were never intended to forecast individual outcomes because that is impossible to do. You are more likely to die on your statistical average date than 10 years before or after. It is not a very accurate approach but it is used because it is the industry standard.

For example, multiple studies show a healthy couple at 60 has a very high chance of at least one spouse surviving 10 years or more beyond the averages; yet, this model doesn’t budget for this outcome. This can impact the output of the FIScore significantly.

Also, longevity has been increasing close to 100 days per year for the past 100 years adding 30 years to life expectancy in the last century. By the time you become part of the statistical average the tables will likely indicate a considerably longer life span when compared to today’s estimate. The point is that today’s average life expectancy tables cannot be used to forecast individual life expectancies in the future. So the best the user can do is to take an educated guess at his/her death. It is a moving target that is regularly growing and nobody knows and nobody will ever know an exact age to die.

What that means is the first assumption – longevity – cannot possibly be estimated with accuracy. The conservative solution is to estimate on the high side because the risk of underestimating is too large to accept.

Inflation is the second factor following longevity, which is difficult to accurately determine. Economists cannot accurately calculate inflation for even one year into the future, yet the user has to forecast inflation 20-30 years into the future to calculate his/her FI score.
The 3% assumption is contradicted by the trends seen in the past few years. The problem in predicting accurate inflation estimates for the future are a number of problems facing today’s economy like government debt, entitlement programs, bank bailouts, and so on. Logic indicates mindless extrapolation of the recent past may not be applicable to the future. The CPI itself is an input computed by the federal government, but its definition changes over time. And to keep down government costs, it is always changed so as to lower its value, which lowers things like social security payouts, even while real spending costs may increase much more. Shadow government statistics, publishes what the CPI would be using the 1990 definition of inflation, and it is much higher than with the current definition [28]. If one’s big expenses are groceries and gas, and the new definition says inflation is close to zero because one gets more computer value for $400 than one did last year, it is difficult to predict which definition is more accurate for the user.

Prices doubled in the 1970s cutting purchasing power in half. The key point is the user cannot estimate inflation for 30+ years into the future with any degree of accuracy or confidence. It’s impossible because so much will change between now and then, creating unforeseeable circumstances that will determine the result. This is incredibly important because small changes in user’s inflation assumption will produce dramatic changes in his/her retirement savings. Depending on other assumptions, a 2% increase in inflation can easily double one’s retirement savings needs. In other words, one little error can make or break one’s financial security. Inflation is the single biggest threat to one’s FI because it can’t be accurately estimated and one has no control over its occurrence, and the effect is compounded over time, thus magnifying small errors into big problems. One has to be wary of the conventional 3% assumption because if it proves optimistic, the impact on one’s financial security in retirement can be dramatic. Thus, the fourth assumption is critically important to your retirement security because it also multiplies through compounding over many years. As discussed earlier, the conventional wisdom assumes future returns will be similar to the past.

Last but not the least, if we look forward and ask ourselves if we can confidently foresee our medical needs, changes in Social Security or Medicare, where we will live, what health issues we will confront, and how much it will all cost, it is highly improbable that all this can be predicted accurately.
The fact is each individual’s situation is unique and no generic assumption will be accurate. The best solution is to formulate your own budget based on your life plans and make your best guess.

4.6 Scalability

We learned from the previous section that the assumptions behind the math are far more difficult than they first appear. However, one needs to have some benchmark for retirement savings. An approximate goal is better than no goal at all. The goal here should be getting the most value from this calculation and not being deceived.

Follow simple rules can be applied to calculate different estimates:

1. Never delude yourself into believing your retirement estimate is accurate. It is simply a calculated projection of the assumptions used. If any assumptions are incorrect the estimate will be similarly wrong.

2. Don’t just perform the computation and forget about it. Check back in a short span of time and see if the predictions made were valid.

In other words, one has to use this application to plan, test, and hypothesize his/her retirement future. It doesn’t restrict and limit the user’s flexibility to change assumptions. Not too many values are hardcoded and therefore it will be extremely useful when properly applied with a clear understanding of the inherent limitations. In summary, the key to success is to understand the inherent limitations and work around them.
CHAPTER 5

ENHANCEMENTS

I have used PHP and MATLAB for the implementation and computation of FIScore and the results were same using both of them. If someone in future can provide a different or an independent implementation of this algorithm the results can determine the correctness of the algorithm. The same results of that implementation will further confirm the correctness of the algorithm.

This is a simple UI that computes a single score for all the values user inputs. The inputs are categorized but the score that is computed is the combination of all those inputs. We do not provide much explanation and information to the user regarding his score for now. In the future, we can provide a more extensive approach and guide the user as to what he/she can do to change his/her score and achieve FI. As an extension to the current solution we can provide different scores for each of the different categories. Some examples of such categories are mentioned below:

- Property freedom
- Debt Freedom
- Labor freedom
- Investment freedom
- Business freedom
- Health Benefits freedom

We can provide different icons for each category. The user will select a category by clicking and he/she will get a score for that category. This will help the user to monitor the areas he/she needs to work upon and which are the areas he/she is doing well with his FI. We can also project this on a graph. The graph will project the score for each chosen category for a desired number of years that user wishes.
REFERENCES


