

**Avocado Toast: A Personal Finance Calculator to Provide Advice for Retirement
Planning**

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Aleksander Schultz

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On my honor as a University Student, I have neither given nor received unauthorized aid on this assignment as defined by the Honor Guidelines for Thesis-Related Assignments

Rosanne Vrugtman, Department of Computer Science

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Aleksander Schultz
Computer Science
The University of Virginia
School of Engineering and Applied Science
Charlottesville, Virginia USA
aps4yj@virginia.edu

ABSTRACT

Despite living in one of the wealthiest countries on Earth, Americans frequently are confused about saving and investing money for long-term financial goals, such as retirement. To solve the problem, I developed a basic personal finance calculator that can take a user's financial situation and their long-term goals and recommend ways to invest to reach those goals with minimal risk. I developed algorithms with the help of well-developed economic theories such as the CAPM model and implemented them in Python to use inputs, such as net worth, income, and retirement plans, to produce an investment schedule. I then transformed these into a simple web application with Flask. The outcome was a proof-of-concept app that, unlike other personal finance apps, can provide specific investment advice and reduce the confusion of investing. Better styling will make the design cleaner, and implementing a user account system will allow information to be saved. In the very long term, the calculator should be just a part of a suite of personal finance applications that can take one set of user financial info and provide analysis, advice, budgeting tools, and more, to create the most comprehensive personal finance application on the market.

1. INTRODUCTION

What should people do with the money that they saved from their most recent

paycheck? After paying their bills and buying what they want to buy, should they put the money in a bank account, buy a treasury bond, invest in penny stocks, buy cryptocurrency, purchase lottery tickets, or choose among the thousands of other possible investments? This is the question that constantly faces hundreds of millions of working Americans.

Personal finance can be a significant source of stress for Americans. Despite having the highest price-adjusted median disposable income in the world (OECD, 2023), most Americans have negative attitudes about money (YouGov, 2023) and live paycheck-to-paycheck (Wronski, 2023). There are many reasons for this, but one of them appears to be poor financial decision making. Americans have extremely high levels of average credit card debt compared to other countries (Kumok, 2023) and only 61% of Americans own any form of stock, including through retirement accounts; this number is much lower for people of color and less educated, lower-income, and younger individuals (Jones, 2023).

The motivation of this project is to help users make financial decisions that promote effective retirement planning, reduce financial anxiety, increase financial stability, and achieve long term goals. By logging their financial situation and receiving direct feedback that suggests investment advice based on financial theories and data, users can be more confident in the decisions they are

making and avoid common financial pitfalls, like investing with too much or too little risk. Overall, this project is intended to be a base for software that can improve users' financial quality of life and reduce stress.

2. RELATED WORKS

Personal finance software exists in abundance. One of the apps that inspired this project is Intuit Mint, a personal finance and budgeting app that allows users to link investment or bank accounts as well as loans or cards to aggregate financial information (Intuit, 2024). This way, they can track their spending and income as well as derived values such as net worth. Users can also set budgets and view their progress towards following these budgets. However, Mint explicitly does not provide investment advice. The app does display offers for cards and accounts but often these are just sponsored advertisements, and the app makes no effort to advise. This means that the app fills a need by allowing users to aggregate financial information but fails to reduce the overwhelming breadth of financial choices that people have.

In the realm of financial investment advice, Abe and Nakayama (2018) produced a machine learning model to predict the performance of stock prices. This provides what Mint lacks in that it offers users concrete advice for financial investment decisions. However, it fails to consider whether investing in stocks is even the right decision in the first place (as opposed to paying off debt or keeping cash) and it does not relate any specific investment advice to the user's financial situation.

To provide effective financial advice, my app will need to make use of economic and financial models. The main model used to relate expected return to expected risk is the capital asset pricing model, covered by Brealey et al. (2023). This model quantitatively describes how investors can take more risk to get more return. I use this

model in my project when the necessary return to reach certain financial goals is determined. With the CAPM model, the app can find an optimal split between low-risk bond investment and high-risk market investment to reach this return with minimum risk.

3. PROJECT DESIGN

The designed solution is a simple web application, a screenshot of which is shown in Figure 1. The application is essentially a form, where users fill out financial information in both static form fields (such as income and age) and in dynamic fields (such as assets). Users then submit the form by clicking "Submit" and receive their financial information breakdown.

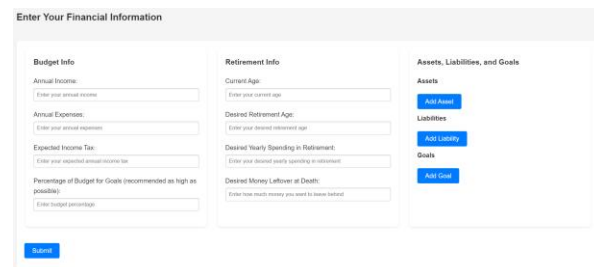


Figure 1: Financial Info Form

The first section of static fields is "Budget Info," which asks the user for information on income and expenses to determine their monthly investment budget. This is critical information, as a consistent monthly investment budget is required to achieve long-term financial goals. The second section of static fields is titled "Retirement Info" and is used to determine how much money users will need to save for retirement. The required variables to determine this are years of retirement (calculated using an assumed death age of 90, to be safe), yearly spending in retirement, and how much should be left over. In the dynamic fields in "Assets, Liabilities, and Goals," users can click the Add button to bring up a section for adding a new asset, liability, or goal. This is shown for the "Add Asset" button in Figure 2. Users fill out

information on the name, market value, expected return, expected risk (standard deviation), and liquidity. The add section for Liabilities is similar, except the relevant fields are name, loan amount, and interest rate. Finally, the mechanism for creating goals is also functionally the same but the fields are the goal name, time left for reaching goal, and the amount to save.

Assets, Liabilities, and Goals

Assets



Liquid

Remove

Add Asset

Figure 2: Dynamic Assets Field

Upon clicking Submit, users are taken to the results screen, shown in Figure 3. This screen produces a step-by-step “financial plan” for users. It tells them what to do with their investment budget, and for how long. This is calculated to allow users to hit all their goals.

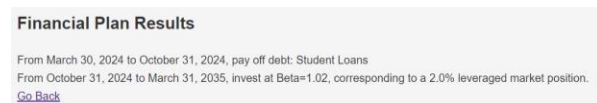


Figure 3: Results Screen

The specific financial calculations done are esoteric so the details will be left out of this report, but those interested can view the [GitHub link](#), as the project is open source. The high-level overview is that the calculator

determines the minimum risk investments needed to hit all the user’s financial goals. First, the money needed at retirement is calculated. Then, by taking the user’s current net worth and the required net worth by retirement (and given the time between those two points and the monthly contribution), the required annual return can be calculated.

Next, the calculator looks through the financial goals and does a similar calculation, determining the required return to get to the point where the goal is feasible. If the required return to get to the goal is less than or equal to the required return to get to retirement, no extra steps are needed, since the goal will be hit automatically; otherwise, a riskier investment strategy will be needed before the goal is hit, and then a less risky one afterwards.

Liabilities are also considered for their interest rates; if the interest rate on the debts is greater than the required return rate, users can achieve this return by simply paying off the debts. The result is that each “step” of the financial plan is either to pay off a liability or to invest in a particular asset, and each step has a specific time/duration. When investing in assets, the calculator uses the required return to determine the riskiness of the asset needed (for low returns the user may invest in bonds/bills, otherwise the user should split between bonds and stock market ETFs or even purchase stock market ETFs from a leveraged position).

4. RESULTS

The outcome of the project is that it completed the purpose of being a valuable financial calculation tool for users and a good base for future work to expand upon. The goal of the project was never to release a workable product, but rather provide users with additional tools to use when thinking about their financial future and to provide developers with inspiration for expansions to their own personal finance projects. The former was accomplished by making a working

application that is relevant to people at various stages of financial stability and age, and the latter was accomplished by releasing the code in a public GitHub repository and modularizing it such that specific pieces can be taken and re-used.

The project did fall short in a few ways. The application is still largely unpolished, with some minor bugs and missing features that were present in the initial text-based version of the app, such as presets for asset types and saving user's financial info so they can easily pick up where they left off. Additionally, as became evident when showing the app to potential users, the application is very technical and difficult to understand for users who do not possess significant financial knowledge.

These are failures that reduce the value of the application as a personal finance tool to help regular people better understand their financial situations. However, the project overall was a success by providing a unique tool for users and for incorporation into future applications.

5. CONCLUSION

This project shows the value of software development in the field of personal finance. Using software like the one developed in this project, users can improve their financial quality of life, leading to improved life outcomes. This project contributes to the field by reducing the confusion surrounding personal finance and giving users *specific* financial advice, which other personal finance software generally fails to do.

Following this specific advice will improve users' financial quality of life by allowing them to reach their life goals by minimizing risk and debt. It is not meant to be a be-all-end-all solution that users can blindly follow; its main value lies in being a tool to help users think about their finances. While the final product has aspects that can be improved in future iterations, the ultimate result was a

contribution to the field and software that provides value to users.

This project has shown both the difficulty and the value of developing personal finance software. On a personal level, the project forced me to learn more about budgeting, risk, and investment, which will improve my own financial outcomes in the long term. It also has strengthened my understanding of planning and creating a web application, which will be helpful in my career.

6. FUTURE WORK

While the project was an overall success, there were aspects that could have been improved upon. First, the styling and design of the user interface was passable but ultimately barebone, as can be seen in Figures 1, 2, and 3. An improved design would make the application more enjoyable to use.

There are also a few bugs and a lack of comprehensive form validation in the application. In rare cases, such as with unusual values in particular fields, no input sanitation/error checking is done and the application will crash and fail to produce a result. This can confuse the user and ruin the purpose of the application to provide dynamic advice based on a range of input parameters. With more effort, form submission can be better validated, and more edge cases can be accounted for.

Finally, looking at long-term future steps, the application should be expanded to first include an account creation system so users can save and easily revisit their information, and then include a suite of more comprehensive personal finance tools. Integrating multiple tools, like Intuit Mint (personal finance and budgeting), Credit Karma (credit scores), and Turbo Tax (tax software) under one account improves synergy among all the applications and enables re-use of information. Other tools to add to my project may include budgeting, AI-powered comparisons of different funds, stocks,

accounts, or loans, and tax assistance. This suite will create a comprehensive system for improving users' financial lives and not just help the economy and society but become a marketable product.

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