

INVARJAN:

Investment planning and Tax automation using RL

GROUP NO. 6

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INTRODUCTION

Along with Tax Automation, Investment Planning and Portfolio Management are also some of the areas where AI can be useful. Better investment decisions come, in part, from more precise asset pricing. More-in-depth analysis provides more accurate inputs for valuation models. AI's freedom from emotions and behavioral biases leads to better investment decisions. Moreover, AI also helps us in managing Portfolios in a better way to reduce risks and to improve profits.

SN.	RESEARCH PAPERS REFERRED	AUTHORS	SEED IDEA 
1.	Semantic Segmentation	Alexander Alemi, Paul Ginsparg	This paper identifies the best algorithm for text segmentation. Content Vector Segmentation is found out to be the best.
2.	Portfolio Management using Reinforcement Learning	Olivier Jin, Hamza El-Saawy	Accurate stock market predictor using Q-learning. Q-learning provides the added benefit of balancing between 'exploration' and 'exploitation' in order to provide the most optimal outcome.
3.	Stock Trading with Recurrent Reinforcement Learning (RRL)	Gabriel Molina	In this paper, an asset trader has been implemented using recurrent reinforcement learning (RRL). It is a gradient ascent algorithm which attempts to maximize a utility function known as Sharpe's ratio.



Learnings from literature

- Better investment decisions come, in part, from more **precise asset pricing**.
- **More-in-depth analysis** provides more accurate inputs for valuation models.
- AI's freedom from **emotions and behavioral biases** should also lead to better investment decisions.
- **Behavioral biases** will continue to influence our investment decisions, often to our detriment.



The above learnings give us answer to a very important question **Why AI?**

1. Deeper Analysis
2. Better Decision
3. Modularity
4. Adaptability



PROBLEMS?



Problems Identified

1. Complex Tax Infrastructure and high cost for CA.
2. Change in ITR forms every year.
3. Less knowledge of investment options available to middle class people
(Lack of financial literacy)
4. Volatile market.





MOTIVATION

The above learnings and problems identified motivated us to achieve the following:-

1. Educate people about the complex Tax structure as well as increase their Financial literacy.
2. Encourage more people to pay taxes by guaranteeing them fixed profitable returns.
3. Helping people through the taxation process and providing them assistance with their Portfolio Management.



Objectives

1

To reduce the complexity of taxation process

2

To create an all inclusive integrated platform for financial assistance.

3

To create a robust adaptive system which can motivate people to pay taxes and manage their own portfolio.

4

To enhance accessibility of financial services.



Problem Statement

To build a simplified platform
using RL to help making complex
financial services accessible to
everyone.



FRAMEWORK - DJANGO

Be_project [~/PycharmProjects/Be_project] - .../Be_project/urls.py [Be_project]

Be_project Be_project urls.py

Project

Be_project ~/PycharmProjects/Be_project

accounts

Be_project

__init__.py

asgi.py

middleware.py

settings.py

urls.py

views.py

wsgi.py

media

services

templates

db.sqlite3

manage.py

requirements.txt

External Libraries

forms.py

settings.py

urls.py

```
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27
28
```

```
2. Add a URL to urlpatterns: path('', views.home, name='home')
Class-based views
1. Add an import: from other_app.views import Home
2. Add a URL to urlpatterns: path('', Home.as_view(), name='home')
Including another URLconf
1. Import the include() function: from django.urls import include, path
2. Add a URL to urlpatterns: path('blog/', include('blog.urls'))
"""
from django.contrib import admin
from django.urls import path, include
from Be_project import views
from django.conf import settings
from django.conf.urls.static import static

urlpatterns = [
    path('', views.login_redirect, name='login_redirect'),
    path('admin/', admin.site.urls),
    path('account/', include('accounts.urls')),
    path('service/', include('services.urls')),
]
```

Terminal: Local (2) x Local x +

```
/Library/Frameworks/Python.framework/Versions/2.7/Resources/Python.app/Contents/MacOS/Python: No module named virtualenvwrapper
virtualenvwrapper.sh: There was a problem running the initialization hooks.

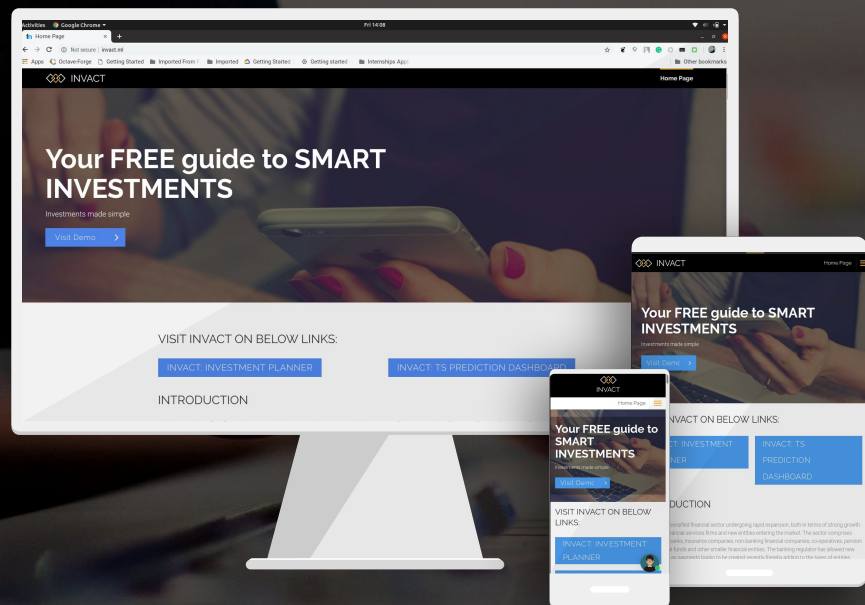
If Python could not import the module virtualenvwrapper.hook_loader,
check that virtualenvwrapper has been installed for
VIRTUALENVWRAPPER_PYTHON=/usr/local/bin/python2 and that PATH is
set properly.
bash: env: command not found
(Be_project) Ishanas-MacBook-Air:Be_project ishana798$
```

⌘: TODO Database Changes Terminal Python Console

Event Log

21:1 LF UTF-8 4 spaces

The solution




InvArjan is a complete online platform which can provide you tax automation and Investment Planning completely backed by advanced AI algorithms.



A close-up photograph of a person's hand holding a pen, pointing at a document. The background is blurred, showing some bokeh lights. The text 'The solution' is overlaid on the left side of the image.

The solution

1. Tax Automation

- 
- A small icon consisting of three horizontal lines, typically used to represent a menu or list.
1. Tax automation part accepts pdf/photo of Form-16 as input and does the following procedure.
 2. We use supervised learning in beginning to achieve tax calculation results and we can convert it to unsupervised in later stages.
 3. Understanding all clauses and insights of the taxation process is critical in this.

10 Aggregate of deductible amount under Chapter VI-A	Rs. 120000
11 Total Income (8-10)	Rs. 428043
12 Tax on total income	Rs. 42804.30
13 Education cess @ 3% (on tax computed at S. No. 12)	Rs. 1284.13
14 Tax Payable (12+13)	Rs. 44088.43
15 Less: Relief under section 89 (attach details)	Rs. 0.00
16 Tax payable (14-15)	Rs. 44088.43

ACTUAL PDF

17 (v) section Rs.	Rs.
18	
19 10 Aggregate of deductible amount under Chapter VI-A	Rs. 120,000
20	
21 11 Total Income (8-10)	Rs. 428043
22	
23 12 Tax on total income	Rs. 42804.30
24	
25 13 Education cess a 3% (on tax computed at S. No. 12)	Rs. 1284.13
26	
27 14 Tax Payable (12+13)	Rs. 44088.43
28	
29 15 Less: Relief under section 89 (attach details)	Rs. 0.00
30	
31 16 Tax payable (14-15)	Rs. 44088.43
32	

DATA EXTRACTED CSV FILE



INPUT AND OUTPUT

INPUT :- Provide a pdf/jpeg/png format of the Form 16

OUTPUT :- We get 3 different formats of o/p

1. CSV file with the extracted text
2. JSON file with the extracted data along with the word-numeric mappings
3. Text file of the extracted data



ADVANTAGES OVER CONVENTIONAL OCR

Following are the advantages of Table discovery over conventional OCR :-

1. Does not follow rigid tabular grid structure like OCR
2. Unlike OCR can detect words, numerics as well as tables and lines
3. Word-numeric mappings are formed like Parent-child mapping; helps in preserving the contextual integrity of the data.
4. Real time training possible because of AWS.
5. Possible to extract data from various file formats like pdf, jpeg, png; a trait lacking in the conventional OCR's.



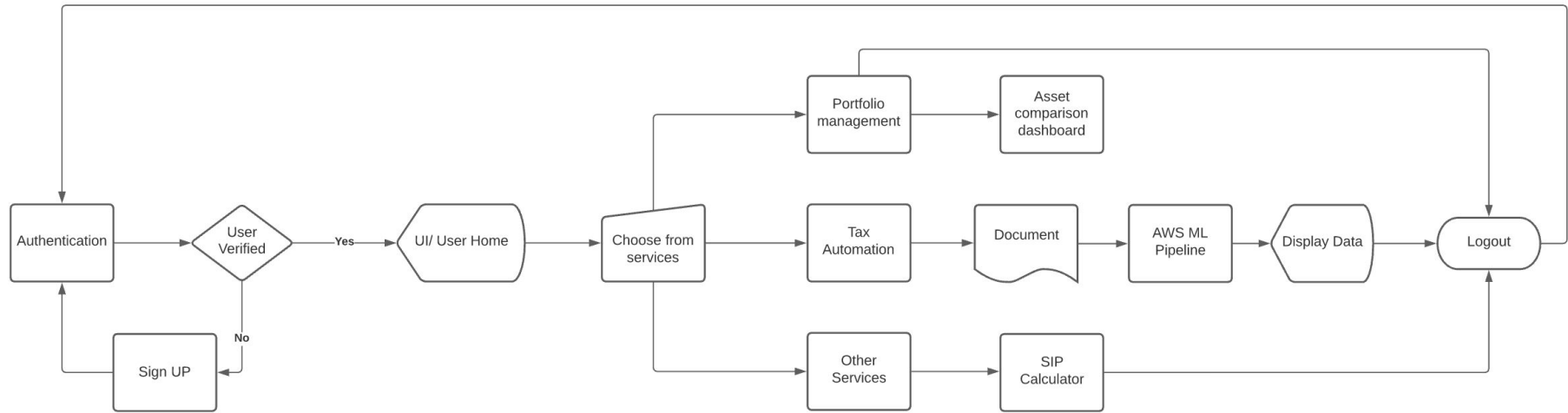
The solution

2. Portfolio Management/ Investment planning:

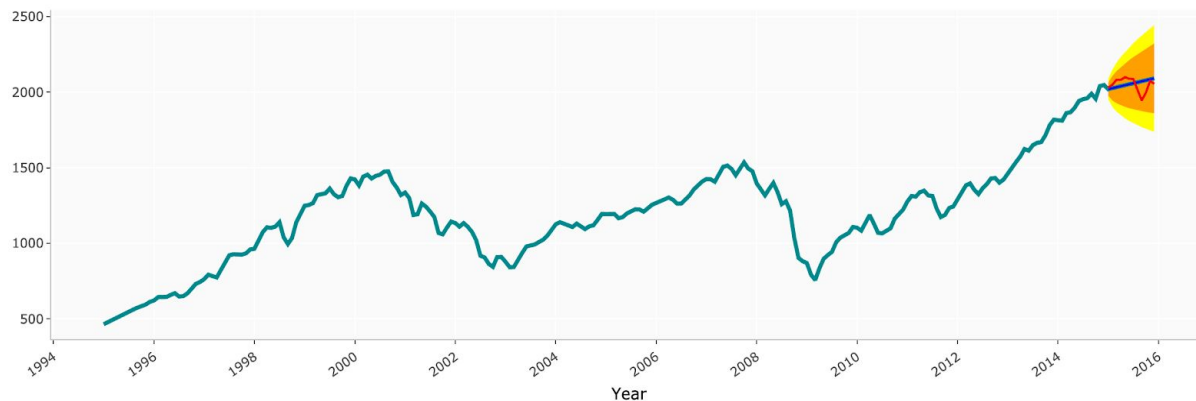
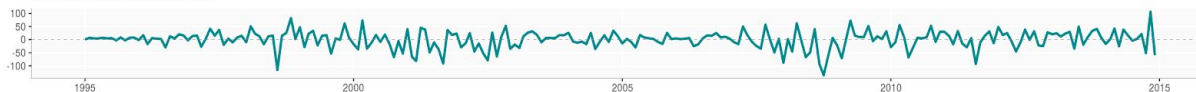
1. A portfolio is a grouping of financial assets.
2. Portfolios are held directly by investors or managed by financial professionals.
3. Investors can construct an investment portfolio in accordance with their risk tolerance and their investing objectives.
4. Educate the user and provide right tools in their hands.



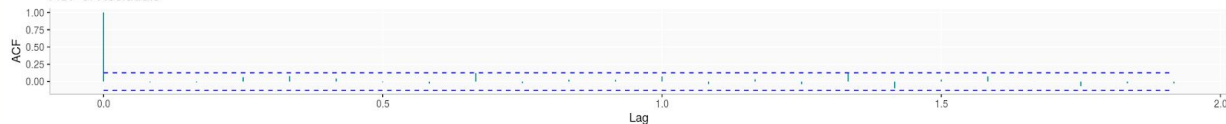
How it works



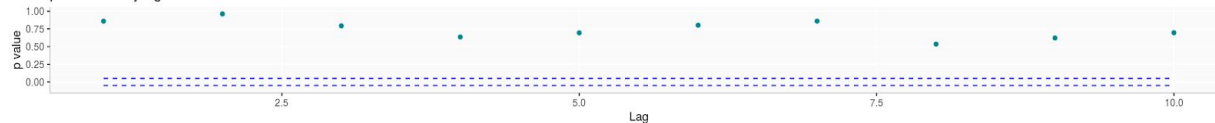
ARIMA Forecast Plot of S&P 500

Residual Diagnostics for ARIMA Model
Non-Standardized Residuals

ACF of Residuals



p values for Ljung-Box statistic



Choose Forecast Method:

ARIMA

ARIMA

Box-Cox Transformation

Exponential Smoothing

Mean Forecasting

Naive Forecasting

Seasonal Naive Forecasting

Neural Networks

MAE	24.8495	45.6111
MPE	-0.0084	-0.3311
MAPE	2.1412	2.249
MASE	0.1311	0.2406
ACF1	-0.0114	0.6954
Theil's U		1.3231

Showing 1 to 8 of 8 entries

Previous

1

Next

Series: sp500_TR
ARIMA(0,1,1) with drift

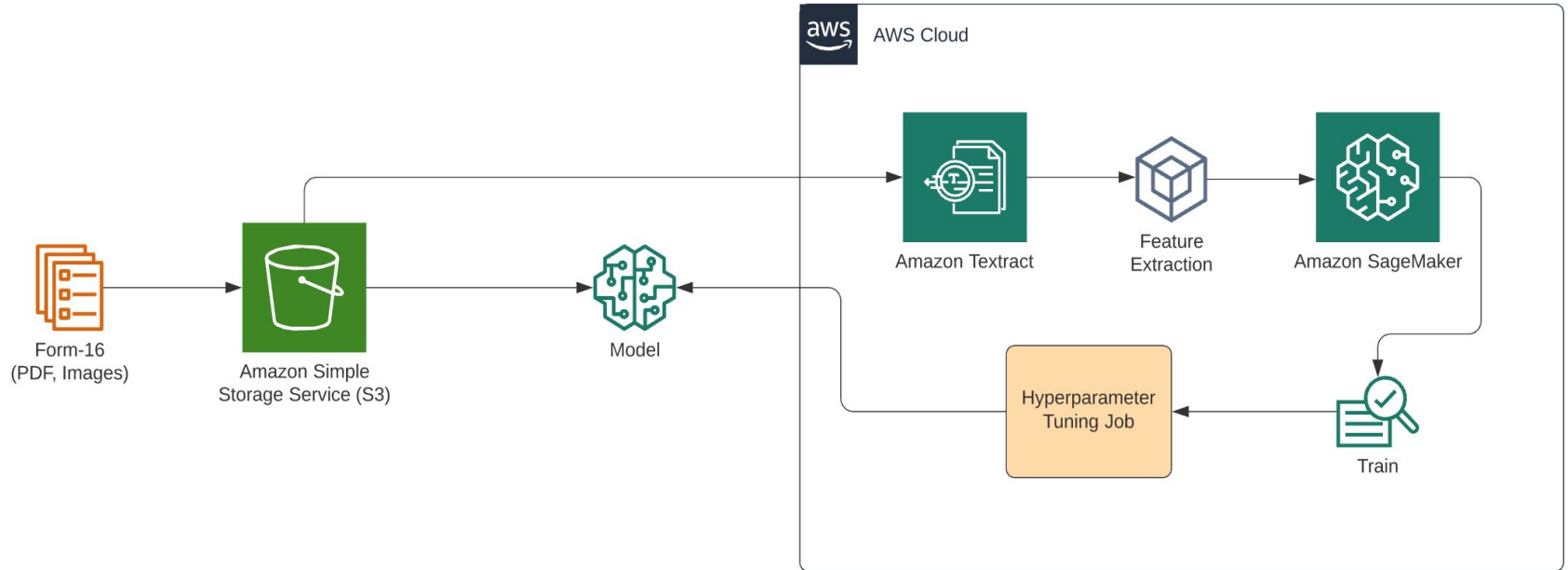
Coefficients:

ma1	drift
0.5666	6.4975
s.e.	0.0551 3.4326

sigma² estimated as 1161: log likelihood=-1181.58
AIC=2369.17 AICc=2369.27 BIC=2379.59

Invarjan ML Architecture

Jayesh Ahire | September 22, 2020



Technology Stack

- Platform:
 - AWS
 - Additional Web Components
 - Django
- Tax Automation
 - Semantic segmentation
 - Sagemaker + Textract
- Investment Planning
 - Real time data
 - R
 - ARIMA



Other Services

SIP Calculator:

Accumulation SIP:



- Same amount invested recursively from starting to end.
- Doesn't consider annual inflation and your salary increment.

Top-Up SIP:

- Investment amount incremented on annual basis.
- Helps you invest more, save more and give exponential returns in end.



Top-up SIP Calculator

Monthly Investment Amount (in Rs.)	<input type="text" value="1000"/>
Investment Period (in Years)	<input type="text" value="15"/>
Rate of Returns (in %)	<input type="text" value="10.5"/>
Annual Increment (in Rs.)	<input type="text" value="500"/>
<input type="button" value="Calculate"/>	

Accumulate Amount (in Rs.)
Your Investment
Your Earnings

What is SIP Calculator?

SIP calculator is a free online tool, which allows the investors to calculate the returns on their mutual fund investment made through the process SIP. In today's day and age, SIP investment is considered as one of the most popular and safest choice of investment. It is specifically designed to provide potential investors with an update on their mutual fund investment. However, the definite returns obtained by a mutual fund scheme may vary based on different factors. SIP calculator does not calculate the expense ratio or exit load (if any).

Wealth Accumulation SIP versus Top-up SIP

SIP or Systematic Investment Plan undertaken over the long term helps you build your wealth. However, when you 'Top-up' your SIP periodically, your wealth has the potential to grow even more. Use this calculator to find put how much your wealth can grow by topping up your SIP.



Login

Username:

Password:

LOGIN

Don't have an Account? Register Now!

[Sign Up](#)

Financial decision making is hard

We are simplifying financial decision making for you!

In an increasingly complex business world, automating the financial decision making process is necessary for increasing accuracy and driving efficiency. A single platform which will work as a customer assistant in providing Tax automation, Portfolio management and Investment planning completely backed by Artificial Intelligence.



Services

Tax Automation

Automate your tax-filing procedure using our service.

Portfolio Management

AI based advanced portfolio management tools to simplify your investment decision making.

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BLOGS



Artificial Intelligence
[What Is AI? Complex Technology in Plain English](#)

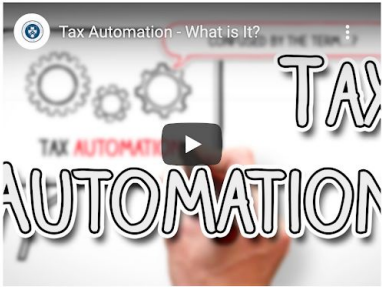
Adapted from an interview with Kfir Bar of Basis Technology



Business
[The Essential AI Value Prop: Lower Costs & Higher Revenue](#)

Adapted from an interview with Joe Sutherland of Peachtree AI

Tax Automation - What is it?



Finance
[Never Search Again](#)

Adapted from an interview with Jason Briggs of Diffeo



Finance
[Job Loss or Pay Cut – How to Protect & Manage your Finance?](#)

Corona Virus Pandemic is creating a massive impact on the economy. Many people have lost their job and many are going towards a bad phase of the pay cut.

What is an Asset?





Portfolio Management

The Portfolio Dashboard will direct you to INVACT that facilitates the comaprison of a myriad of assets both traditional and crypto across time.

This tool is modular in nature, such that there are some parameters that affect the entire app, and others that only affect certain outputs.

This allows the user, at a high level, to select assets of interest, a date-range of relevance, and an initial investment amount, and thereafter compare the chosen assets using a variety of metrics.

The app facilitates this procedural evaluation by nature of its layout, such that there are sections that focus on portfolio value, simple returns, and risk-adjusted returns.

PORTFOLIO DASHBOARD



INVARJAN

POWERED BY



Dialogflow

Walkthrough of how the app works

Report a bug or make a request

Examine the code behind the app

Visit Invaict prediction Dashboard

Read our Blog

Use lowercase to input crypto assets.
Use uppercase for all others.

Select 1st asset of interest:

eth

Select 2nd asset of interest:

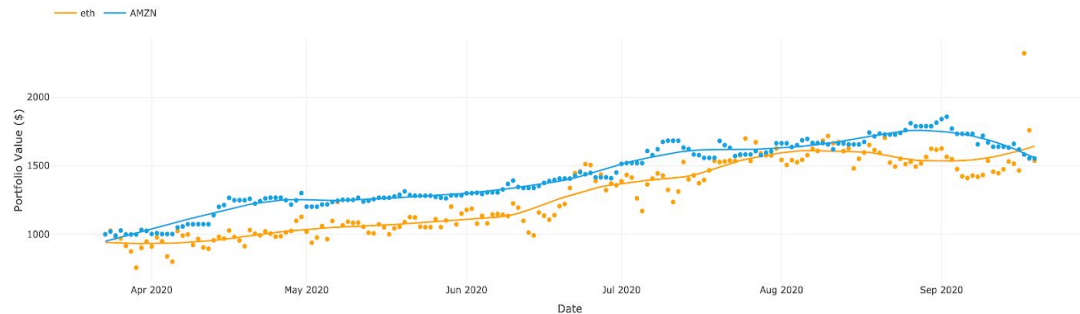
AMZN

1st date = date of initial investment
2nd date = last date in time series examined

Choose date range of interest:

2020-03-23 to 2020-09-19

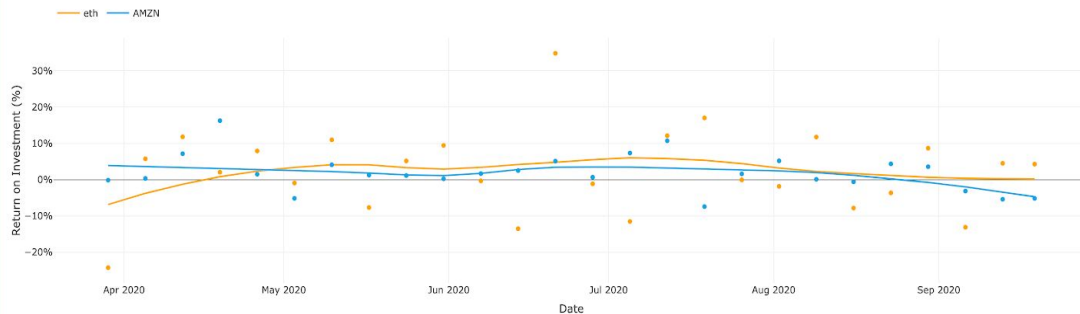
Portfolio Performance Chart



Portfolio Performance Summary Table

Asset Names	Asset Portfolio Max Worth	Asset Portfolio Latest Worth	Asset Portfolio Absolute Profit	Asset Portfolio Rate of Return
eth	2319.608	1596.747	796.453	34.3445%
AMZN	1897.494	1852.903	552.903	55.2903%

Investment Returns Chart



Portfolio Performance Inputs

This box focuses on portfolio value, i.e., how much an initial investment of the amount specified below (in USD) would be worth over time, given price fluctuations.

Enter your initial investment amount (\$):

1000

The slider below modifies the [smoothing](#) parameter used in the [LOESS](#) function that produces the lines on the scatterplot.

Smoothing parameter for portfolio chart:



The table below provides metrics by which we can compare the portfolios. For each column, the asset that performed best by that metric is colored green.

Investment Returns Inputs

This box focuses on [rate of return](#) calculated at the level of detail specified below.

Period over which to calculate returns:

weekly

The default smoothing parameter for the returns chart is slightly higher than the default for the portfolio performance chart given that returns data are generally aggregated.

Smoothing parameter for returns chart:



Variance-Adjusted Returns Chart

Variance-Adjusted Returns Inputs

AMZN

1st date = date of initial investment
2nd date = last date in time series examined
Choose date range of interest:
2020-03-23 to 2020-09-19

Date

Portfolio Performance Summary Table

Asset Names	Asset Portfolio Max Worth	Asset Portfolio Latest Worth	Asset Portfolio Absolute Profit	Asset Portfolio Rate of Return
eth	2319.608	1796.740	526.443	22.714%
AMZN	1697.044	1652.903	52.9028	3.12003%

Investment Returns Chart

Investment Returns Inputs

This box focuses on rate of return calculated at the level of detail specified below.

Period over which to calculate returns:

weekly

The default smoothing parameter for the returns chart is slightly higher than the default for the portfolio performance chart given that returns data are generally aggregated.

Smoothing parameter for returns chart:

0.1 0.35 2

Variance-Adjusted Returns Chart

Variance-Adjusted Returns Inputs

This box focuses more specifically on the average rate of return in excess of the risk free rate per unit of volatility, as captured by variations of the Sharpe Ratio. Be sure your chosen risk free rate matches up with your selected time period. Default is 30 basis points for the weekly risk free rate.

Choose risk free rate (as decimal):

-0.1 0.003 0.1

The confidence level chosen is used in the Sharpe Ratio calculations.

Choose confidence level (as decimal):

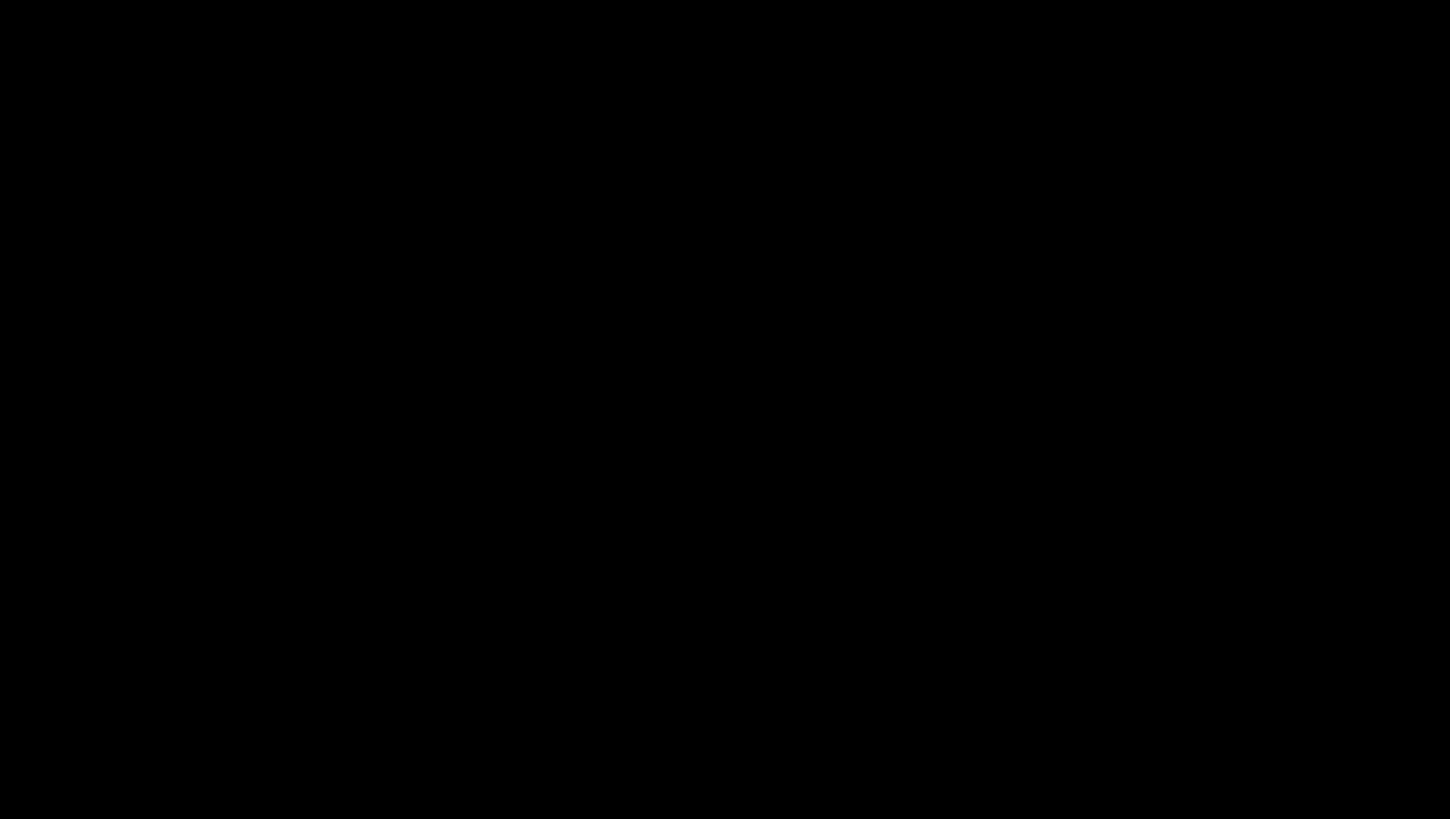
0.1 0.95 0.99



Upload Form 16 PDF

No file selected.

[Return to home](#)





Limitations

1. Even though the table discovery model works well for typed documents or photos, it sometimes fails to recognise handwritten documents.
2. Even though we are working with a diversified group of assets, we would like to add few more assets and certain crisis management investment plans to the model.
3. Current system caters well to the salaried population only.
4. The current system is not able to tackle unannounced market risks eg: Covid19 impact on the market.



Future Scope

1. Enhancing the capability of the Table discovery model to accommodate handwritten documents efficiently.
2. Expanding the asset collection with few more assets.
3. Expanding the customer base to businesses as well.
4. Making the model robust to handle unannounced risks.
5. Scaling up the prototype to accommodate higher traffic on the webApp.
6. Optimising cloud cost.



Conclusion

- People in developing country like ours lack financial literacy and there are very few ways which enable them to be able to take decisions like investment planning.
- Taxation is getting complicated over every year and our tax automation process paves the way for better solution in coming period as we solved really important problem of data extraction here.
- This is not a user-ready project yet but it's a step in a right direction.
- Our tech stack is based on futuristic modular technologies and utilising them in right way will for sure help us in our goal to create a financial platform not everyone desires but everyone needs!



Thank you.

