

## 1 Personal Research (1-2 hours)

I want you to conduct some independent research in relation to finding optimal entries and exits in the stock market or other financial markets. Dive down any topic you feel is interesting to you and is within the scope of this project. For example, you can look at different indicators (i.e. `MACD`, `RSI`, etc.) or more specific and complex strategies, or maybe even ways to telling whether a stock is over/undervalued. The goal is for you to see what's out there and get broader view of the field before we dive down into specifics during our research. Follow your curiosity, and have fun! No need for a complex report, just take detailed enough notes so you can share what you found with the group next week. I don't expect you to be experts within just a few hours!

## 2 Jupyter Notebook (2-3 hours)

I would like for you to start working in Jupyter notebooks and getting your hands dirty right away. I think a good way to get started is for you to follow do some examples. Here is a [tutorial](#) I would like you to follow with some extra instructions:

1. You can use any stock you want. I used Google stock (`GOOGL`), but program your notebook so that picking a different ticker for all your plots is easy (so that you only need to change one line of code if you want a different stock)
2. Look up the mathematical definitions of the indicators and write them down in markdown cells above your code blocks. If you know `LaTeX` this should be easy but if you don't then just write them down somewhere else for now.
3. Add markers corresponding to points on the close price plots where a trading bot using the indicator would have bought/sold (see Figures 1 and 2 for an example).
4. Make sure your top and bottom plots have their x-axis aligned (you can do this with `sharex=True`)
5. Try to compute the number of winning and losing trades for each indicator.
6. If you have time apply these to the NASDAQ-100 ETF (`QQQ`) as well and see if there are any differences in behavior for some indicators.

**N.B.** I'm not sure which machines you are using but if you are using a MacBook I would recommend using `VSCoDe` along with `uv` and `pip` to install your modules in a `venv`. For example you could do `uv venv` to create a virtual environment and activate it with `source .venv/bin/activate`. Then install your modules with `uv pip install numpy matplotlib pandas yfinance TA-lib`. `TA-lib` is sometimes tricky since it has some C dependencies so you can also try `pip install --upgrade pip setuptools wheel` followed by `uv pip install TA-Lib` or `brew install ta-lib` if you have `homebrew` installed which worked for me.

## Notes

- Try to aim for 4 hours of work per week (3-5 hours is the recommended amount). Feel free to do more if you want but there is zero pressure to do so! **If this week's work takes longer than 4-5 hours you don't need to go overtime, just let me know where you got to.**
- If you are fast at setting up the notebook and going through the tutorial, you can either get creative and play around with plotting new indicators and adding detail to your existing work or you can do some more personal research.
- If you are struggling with anything you can ask me questions anytime! (Yes even on weekends and evenings; I try to respond as soon as I can. I'm not online 24/7 but you don't have to wait until Monday 8am to ask me questions)

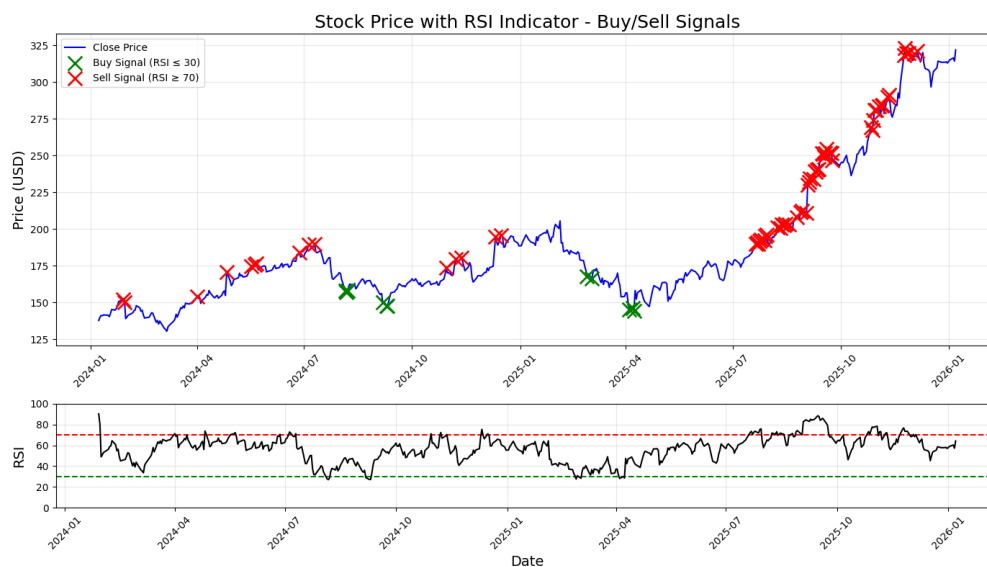


Figure 1: GOOGL close price with RSI indicator markers

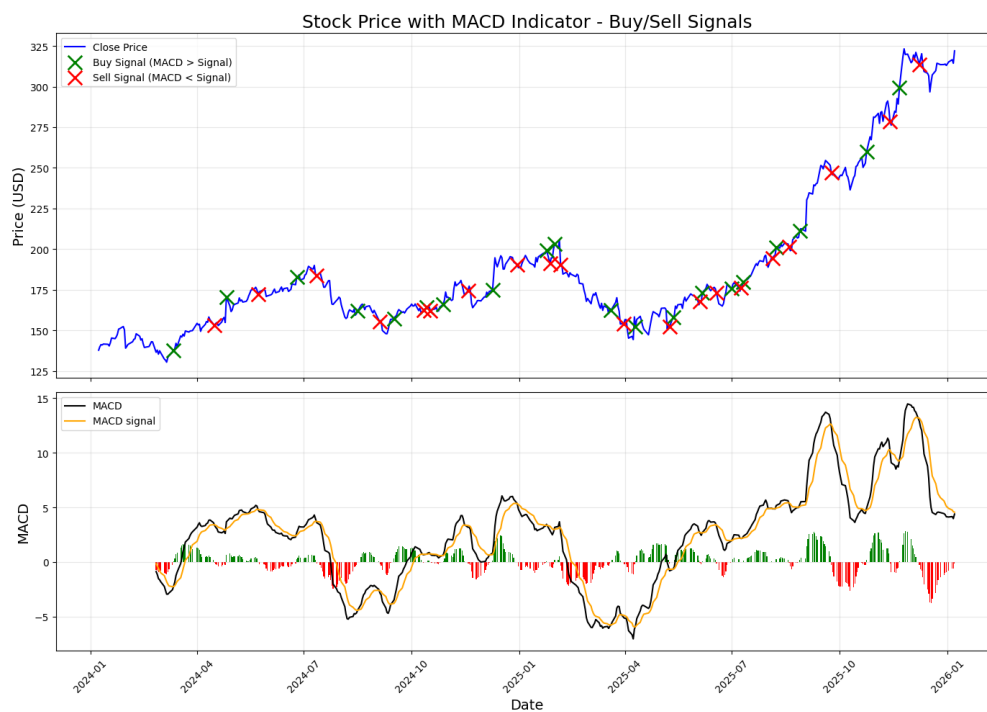


Figure 2: GOOGL close price with MACD indicator markers