

Navigating the Outsourcing Experience: Strategies and Insights

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1 Introduction: Summary of the Project

As a group of students in finance, we were attracted by the topic of market imperfections and how various market players utilize them to extract profits. It motivated us to come up with the idea of setting an algo trading strategy based on mainstream theorems and assumptions in finance. The strategy involves comparing S&P 500 asset allocation weights with holdings of the seven largest US financial institutions (FIs) by assets under management (ADV Ratings n.d.). Stocks are classified as "SELL" if FIs overweight them relative to the index and "BUY" if they are underweight. This approach leverages the Market Efficiency Hypothesis (MEH) which asserts that markets quickly incorporate all available information (Fama 1970). Furthermore, the strategy incorporates the Fama-French 5-factor model (FF) to refine stock selection based on market risk, size, value, profitability, and investment factors (Fama & French 2015). Stocks are evaluated for over- or underpricing relative to model-predicted returns. By matching over- or underweight positions of FIs with stock mispricing identified by the model, up to 5 assets are selected for over- and under-valued portfolios respectively.

However, as is obvious from the description of the strategy, we have to perform substantial data collection, in addition to calculation and algorithm setup. Here is where outsourcing comes into play, which has become a pivotal strategy for modern businesses seeking to optimize their operations and strategic focus. By entrusting specialized tasks to external partners, organizations can tap into expertise and resources not readily available in-house. This approach not only enhances operational efficiency but also allows companies to streamline costs, scale operations more flexibly, and accelerate innovation (Darwish 2021). Thus, the idea of the project is to outsource the part of the code required for a trading strategy that our team has come up with while instead leveraging the process of outsourcing by gaining the necessary skills for successful cooperation with external experts who perform a specific task in their field of expertise without understanding the full venture.

2 Specification Book and Deadlines

To start with, we had to obtain relevant data which we wanted to do by scraping current S&P 500 ("S&P 500 ETF Components" n.d.) asset allocation weights and the holdings of the FIs from US Security and Exchange Commission ("EDGAR — Company Filings" n.d.). The first one is straightforward with extracting the table from the given website. The second one has to scrape the values column from 13F reports of all the FIs, eliminate the non-equity values, add all portfolios together, estimate the weights of this portfolio for S&P 500 assets only, compare obtained weights with the ones from the S&P 500 table scraped before and output the Excel file with following columns: "Ticker",

"Weight", and "Position". The latest included a "Sell" entry for companies whose weight in S&P is lower than in the combined portfolio of the FIs and a "Buy" for higher. After the scraping, we had to get the predicted prices of the stocks using the FF model. For this, we scraped the table of FF returns from the eponymous website (Tuck School of Business n.d.) and used the yfinance package in Python to scrape the data of S&P stock returns. Thus the code used tickers from the scraped S&P 500 portfolio to extract the monthly returns through the FF model, estimated predicted monthly returns for the last month of the FF data (so that the period of observation is the same) from which it took estimated prices of the stock and output the data frame which consisted of two columns: "Ticker" and "Position" where overpriced stocks had "Sell" and underpriced "Buy". Then it compared the results of the second scraper and the results of the FF predictions, separated those stocks whose position matched, then took up to five most over- and five most underweighted stocks, normalized their weight within their combined portfolio, and assigned predicted prices obtained from FF. Finally, the table will be produced with columns including ticker, position, quantity, and limit price.

Finally, we create a trading algorithm that will use an Interactive Brokers paper trading account to trade the obtained portfolio once a year. Afterwards, before the FF estimations part next year, the separate piece of code will liquidate the portfolio by cancelling unsatisfied limit orders, selling/buying the remaining stocks at a market price, and estimating the yearly return of the strategy based on the initial (one we have to input manually) and the current value of the cash on the account.

Regarding the distribution of the tasks, the outsourcer will have to take the scraping from the first part of the project, namely creating the FIs portfolio and comparing it to S&P. It makes sense since the outsourcer obtains the data in the form we will utilize and there is no estimation that makes our strategy work. meaning that we do not expose the second puzzle of FF comparison while obtaining the first. It is important to clarify that prime members of the team were in charge of the specific project task while all were working together on all of them i.e. writing the code and all the papers. Oleksandr managed communication between the outsourcer and the team which consisted of updating his team on the progress of the first part of the project and making relevant corrections on the second one if needed. Jacopo was in charge of the Fama-French modelling, comparison of the two models, and outputting the final portfolio. Francesco was responsible for the trading algorithm and documentation for the entire paper.

In terms of design, we expect a kind of app from the outsourcer that by double-clicking runs the entire code and outputs a single Excel file with S&P 500 tickers, a weighted difference of FIs' holdings and S&P, and the corresponding trading position - buy or sell. On the other hand, the rest of the code would be done in Python by us and be run manually. Ideally, this strategy should be run on a server so that we do not need to run the code by ourselves every year. Although renting a server to be active once a

year makes even less sense thus, we keep it simple.

3 Finding an Outsourcer

After distributing the duties among team members and identifying the part to outsource, we had to find a person who would be capable of performing the task for us in an efficient and timely manner. One of the team members, namely Oleksandr, knew that there was an IT company called InventorSoft in his hometown in Ukraine that specialized in outsourcing ("About Us" n.d.). It was founded in 2015, has between 100 and 120 employees, and provides services for various industries including Fintech (Vlad Nazarov 2024). The decision was made to go on LinkedIn and contact employees of the company to find out whether someone is willing to take part in our project. The decision was made in favour of Ihor Kapralov (LinkedIn n.d.), junior .NET Developer of InventorSoft who was finishing his master's at Yuriy Fedkovych Chernivtsi National University. After a short conversation on LinkedIn (Figure 1) on the 17th of April, we proceeded to have a chat in Discord to get to know each other.

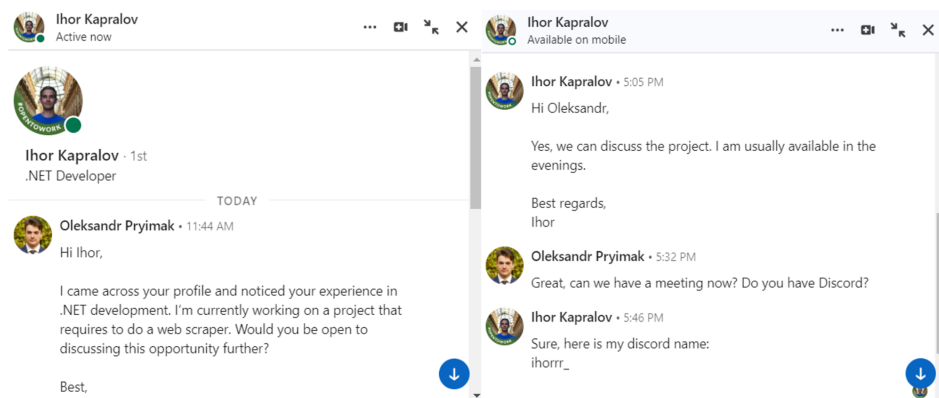


Figure 1: Conversation with Ihor Kapralov on LinkedIn

We were lucky since Ihor was previously involved in a scraping-related project at his place of work. The hourly rate for the programming was 10\$/H while meetings did not count as part of coding and hence were not charged. He also said that the payment for the code is done after the completion and after that, he will aid in running the code on our devices if we encounter any issues. Wise to mention that we wanted to experience outsourcing with a coder who uses a different language to understand the challenges of miscommunication between him and the client. Therefore the specialization of Ihor in C# matched the profile we were looking for. From this follows that the program was written for Windows while launching it on macOS requires a virtual machine.

4 Milestones and Timeline

Our first project meeting with Ihor occurred on the 20th of April and was highly productive although it lasted a bit over an hour. The first thing that was told to him was what he had to do in the same way that was described in the previous chapter of this paper. However, he requested to describe the project entirely, which we did without going deep into the financial specifications such as the explanation of the Fama-French 5-factor model. As it will become more obvious later on, the reason for a programmer to know what the entire program should do is to give us some advice on the most efficient way to output the results. For instance, one small correction that he made was instead of having two files, one with tickers and another with weights, combine the output so that it is easier to compare the results of the outsourcing to our FF predictions in the second part of the code. The second thing discussed was the material that the outsourcer will work with, namely the website we use for current S&P 500 weights and the 13F reports of the FIs from EDGAR. The former required a link while for the latter we needed to provide the exact link for the 13F file of all seven FIs we are working with. Lastly, we defined the priority of the tasks in a way that the scraping of the index will be done the next day while with the rest, Ihor will work after he finishes his current project.

During the second project meeting on May 18th, the coder ran into the first problem, namely that to refer to a specific stock in all 13F reports, he needed to have the Committee on Uniform Securities Identification Procedures (CUSIP) number of every stock in S&P. A CUSIP number consisting of nine characters uniquely identifies most financial instruments in the U.S. and Canada, facilitating their clearance and settlement ("CUSIP Number" n.d.). Due to its uniqueness, it remained the same across all the 13F reports which made it very useful to track stock whose names change from one report to another. After an hour-long discussion and googling, the solution was found to make an additional scraper which would take the scraped data of S&P, search stocks by tickers on a website called QuantumOnline.com and add a column with CUSIP numbers to the existing S&P 500 file. The website provides comprehensive information and tools for researching and tracking various securities including stocks, bonds, and other investment vehicles (QuantumOnline n.d.). The next problem was related to our decision to see what kind of denominator makes more sense to use – only S&P stocks or all equity in the combined portfolio. After the trial of both, the decision was made in favour of S&P only since it outputted more rational weights, unlike the equity code that underweighted almost all the assets of S&P. It was an expected outcome given that institutional investors do not limit themselves to S&P stocks only and aim to achieve higher diversification by investing in shares of companies all over the world and engaging in active hedging to limit the loss in case of a market downturn. Finally, Ihor pointed out that some of the stocks may not be in the portfolios of all companies which is why he suggested making a line which would take

only those stocks which show up in at least six out of seven institutions.

The third meeting on June 8th was the one which had the entire code completely run on Oleksandr's laptop, which took an hour to achieve mainly because the correct version of .NET was not installed on the device. After that, Oleksandr produced the same output as was shown by Ihor at the beginning of the meeting. After that, the outsourcer said that if we needed to perform a backtest, it would require him an additional hour to complete the code and deliver it to us. For this, we needed to provide him with the list of links to the EDGAR of the FIs for the number of years we were willing to test as well as the asset allocation of the S&P 500 on the same time interval. Unfortunately, we failed to satisfy the latter which made the back-testing part impossible.

Hence, Ihor delivered the code on the third meeting on which he spent a total of 20 hours meaning that outsourcing part of our project cost us 200\$. The money was delivered as agreed before being run on our devices.

5 Conclusion

The outsourcing project provided us with valuable insights into the advantages of outsourcing. First of all, by delegating the scraping component to an external developer, we had more resources allocated to the R&D of the project's methodologies. The collaboration with Ihor Kapralov also significantly sped up the progress due to his expertise as well as providing us with an extra advisor regarding the coding process overall. Finally, this experience highlighted the importance of communication between people of various specializations in achieving a common goal. Leveraging our coding knowledge improved our ability to understand and integrate Ihor's contributions which led to a more productive collaboration. Looking ahead, the lessons learned from this outsourcing project will undoubtedly influence our approach to future projects, guiding us to greater efficiency, innovation, and shared success.

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