Operating Systems and Stock Market Trading

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Learning Outcomes

- Understand how operating systems aid in modern, online stock market trading
- Understand, at a very basic level, how to use Alpaca's and TD Ameritrade's trading APIs

Online Trading

- What it is and how it works
  - A way to trade shares (and more) of a company online
  - Robinhood, Schwab, TD Ameritrade, ETrade, etc.
- Algo/bot trading
  - Easy patterns that are boring
  - More calculated patterns
  - Removal of human element

SAAS vs. PAAS

- Software as a Service
  - Offering access to centrally hosted software
- Platform as a Service
  - Environments with development tools
- Many trading companies offer SAAS Models
  - Smaller tech companies
    - Alpaca, Interactive Brokers, Robinhood, Quantconnect, Webull
  - Many major banks
    - Merril, Charles Schwab, ETrade
- Others offer a hybrid or both
  - TD Ameritrade, Alpaca Broker

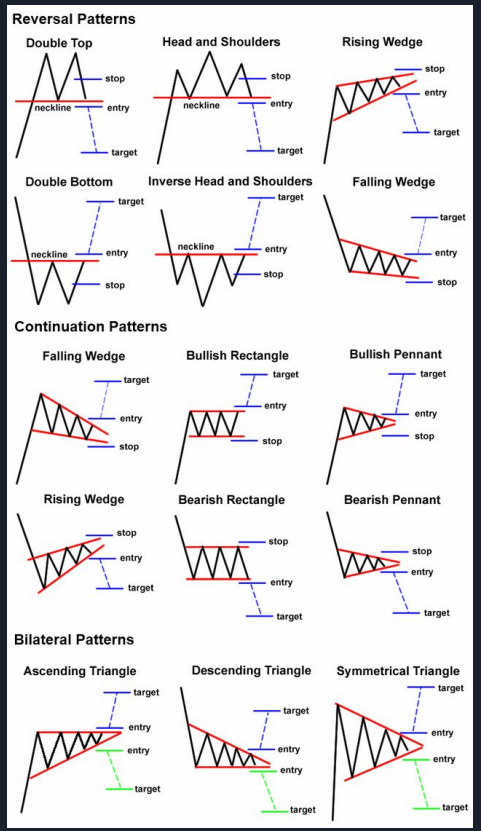
APIs

- Either way, you need an API to interact with many of them
- An API is an Application Programming Interface
  - Software interface between two systems or computers
    - Between your browser/app and the brokerage's system
  - Allows you to make requests regarding actions you need without having to understand the intricacies of their system
    - Can just send an order without knowing how exactly it executes
    - Can request data without knowing how to actually fetch it
    - Formats outputs and responses to work on your computer
  - Connect using an API "key"
    - A way to identify and authenticate users

API Benefits

- API benefits
  - Can use to buy or sell manually or with bots
  - Can pull real-time and historic data
    - Process locally however you'd like
  - Can submit trades based on market conditions
    - Chart Patterns
    - Doji Candles

https://www.dailyfx.com/education/candlestick-patterns/types-of-doji.html



https://www.reddit.com/r/Daytrading/comments/6dfdhy/here_are_some_chart_patterns_to_keep_in_the_back/

Alpaca Introduction

- “Alpaca is a technology company headquartered in California Silicon Valley that builds an API-first stock brokerage platform”
- Focused on trading with APIs rather than apps
- Commission free
- Offers real time trading, paper trading, sandbox environment and example algorithms

Alpaca Example

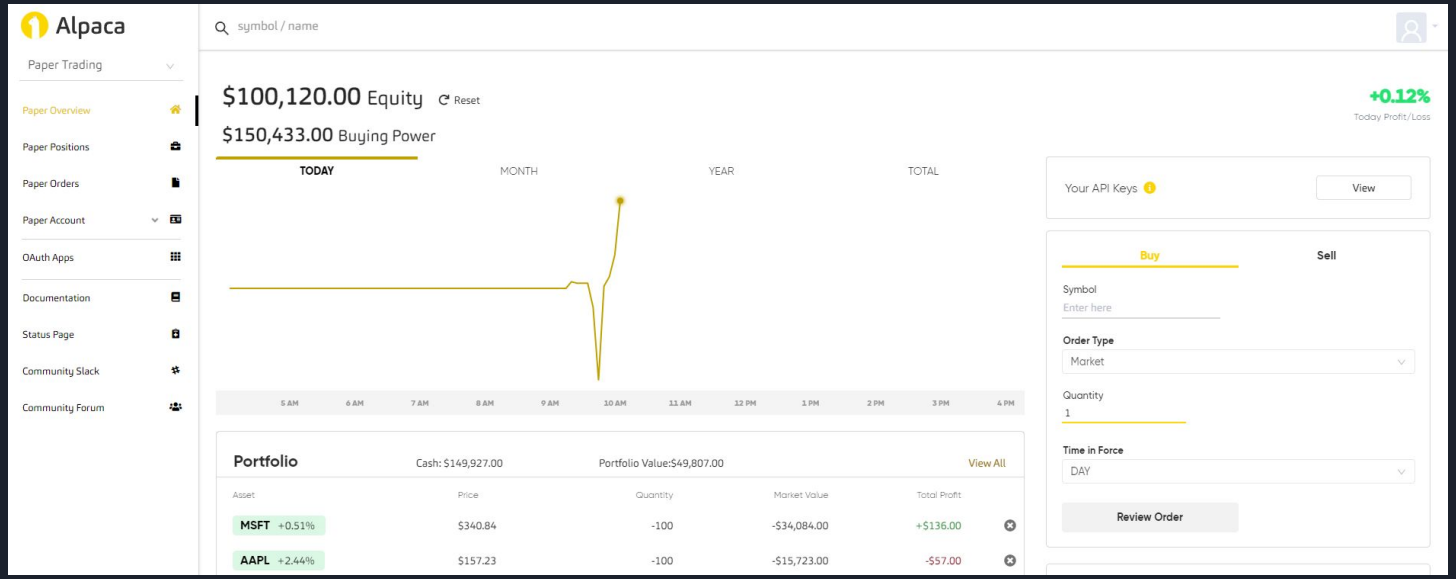
```python
import requests, json, time

API_KEY_ID = "[redacted]"
SECRET_KEY = "[redacted]"

BASE_URL = "https://paper-api.alpaca.markets"
ACCOUNT_URL = "{}/v2/account".format(BASE_URL)
ORDERS_URL = "{}/v2/orders".format(BASE_URL)
HEADERS = {'APCA-API-KEY-ID': API_KEY_ID, 'APCA-API-SECRET-KEY': SECRET_KEY}

def get_account():
    r = requests.get(ACCOUNT_URL, headers=HEADERS)

    return json.loads(r.content)


def create_order(symbol, qty, side, type, time_in_force):
    data = {
        "symbol": symbol,
        "qty": qty,
        "side": side,
        "type": type,
        "time_in_force": time_in_force
    }

    r = requests.post(ORDERS_URL, json=data, headers=HEADERS)

    return json.loads(r.content)


create_order("CZR", 100, "buy", "market", "gtc")
create_order("RIVN", 100, "buy", "market", "gtc")

account_info = get_account()
print("Shares purchased. Remaining buying power: ", account_info.get("buying_power"), account_info.get("currency"))

time.sleep(240)

create_order("CZR", 100, "sell", "market", "gtc")
create_order("RIVN", 100, "sell", "market", "gtc")

account_info = get_account()
print("Shares sold. Remaining buying power: ", account_info.get("buying_power"), account_info.get("currency"))
```

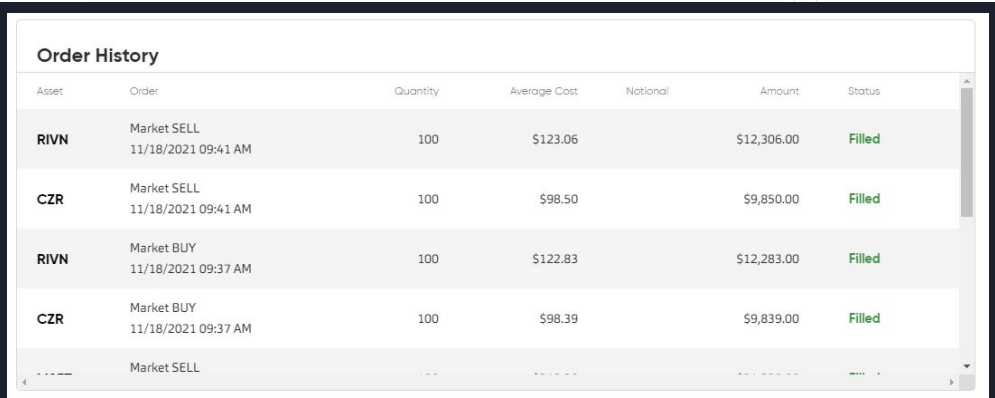
```
PROBLEMS  OUTPUT  DEBUG CONSOLE  TERMINAL
Shares purchased. Remaining buying power:  127815 USD
Shares sold. Remaining buying power:  150064
PS D:\Max\Documents\AlgoTrading\AlgoTrading>
```

- Buys shares, waits 4 minutes, then sells them
- Can also use API to pull real-time market data and trade based on that
  - Doji Candles

Based on code from https://github.com/hackingthemarkets

Alpaca Results



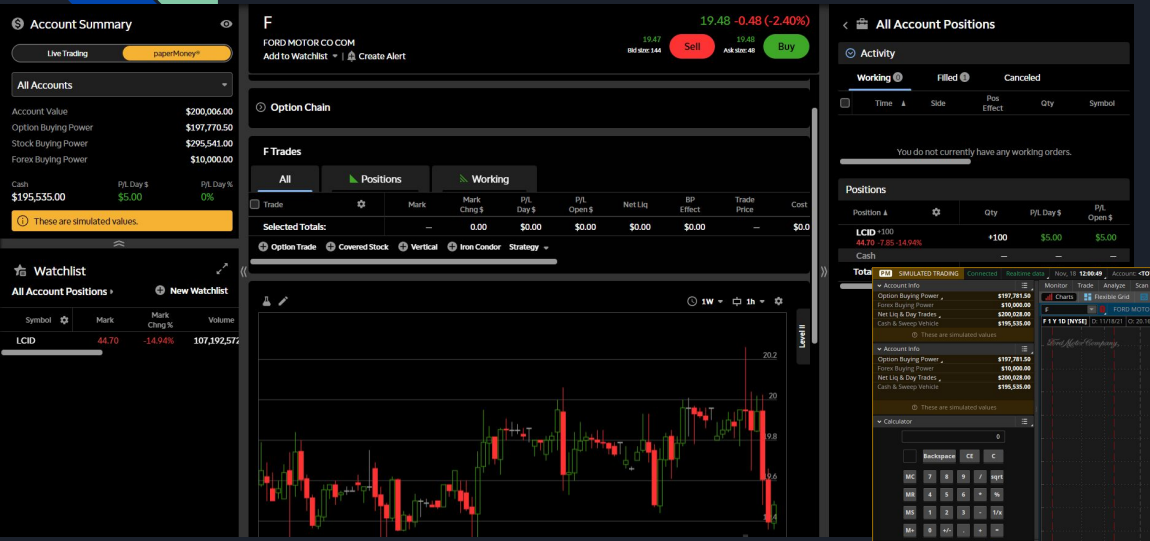


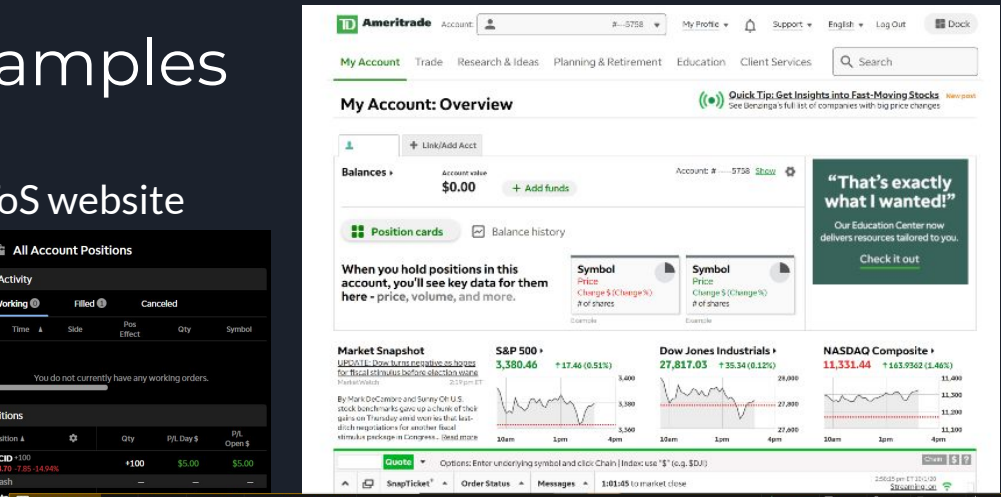
TD Ameritrade Introduction

- Large online broker
  - Stocks, option, futures, forex, crypto, mutual funds, IRAs, etc.
  - Now owned by Charles Schwab
- How It's used
  - Website
  - Think or Swim
    - App vs. Online
  - Developer tools
    - PAAS and API

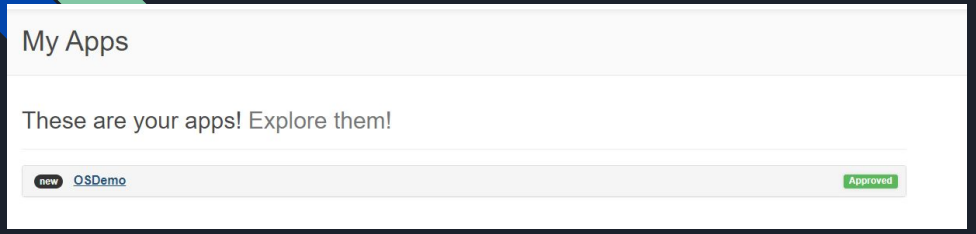
TD Ameritrade Examples

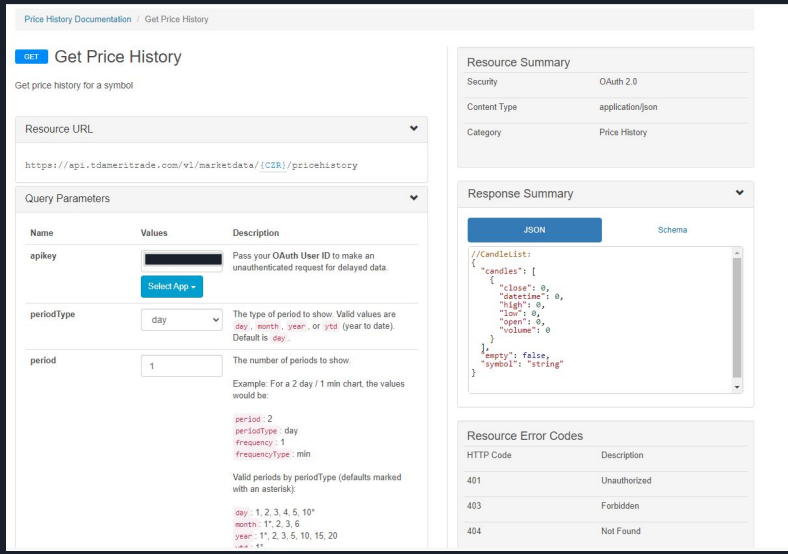
- Dashboard vs. ToS online vs. ToS website





TD Ameritrade Dev Example






```
TDExampleForOS > OS_Example.py > ...
1   import requests
2
3   key = '[redacted]'
4
5   def get_price_history(**kwargs):
6
7       url = 'https://api.tdameritrade.com/v1/marketdata/{}/pricehistory'.format(kwargs.get('symbol'))
8
9       params = {}
10      params.update({'apikey': key})
11
12      for arg in kwargs:
13          parameter = {arg: kwargs.get(arg)}
14          params.update(parameter)
15
16      return requests.get(url, params=params).json()
17
18  print(get_price_history(symbol='CZR', period=1, periodType='day', frequencyType='minute'))
```

```
PROBLEMS  OUTPUT  DEBUG CONSOLE  TERMINAL
'high': 101.07, 'low': 100.92, 'close': 101.003, 'volume': 2100, 'datetime': 1637161920000}, {'open': 100.98, 'high': 101.03, 'low': 100.8
80000}, {'open': 100.935, 'high': 101.09, 'low': 100.89, 'close': 101.05, 'volume': 2632, 'datetime': 1637162040000}, {'open': 101.065, 'h
, 'datetime': 1637162100000}, {'open': 101.15, 'high': 101.2, 'low': 100.97, 'close': 100.97, 'volume': 3600, 'datetime': 1637162160000},
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100.95, 'close': 101.07, 'volume': 3355, 'datetime': 1637162340000}, {'open': 101.0, 'high': 101.05, 'low': 100.94, 'close': 101.0, 'volum
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```

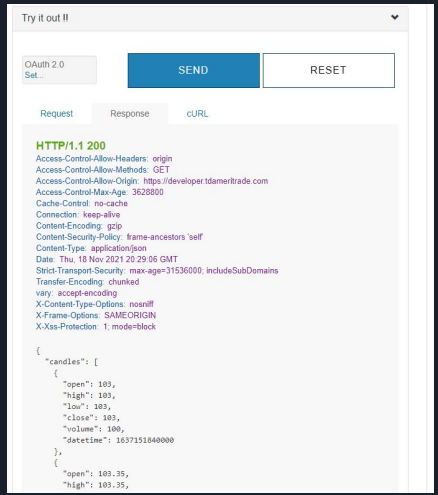

Based on code from https://github.com/robswc

Conclusion

- SAAS, PAAS, and APIs are the backbone of modern investing
- They make the stock market available to everyone from an 18 year old dipping their feet into Robinhood to giant hedge fund running trading algorithms
- You can use websites, apps, and web hosted apps at any level of complexity you desire