Part I. Margin Study [50pts]

1. Write two Python functions to calculate margin call price given the initial stock price (price0), the number of shares (nShares), account equity (actEqy) in dollar amount, and maintenance margin requirement (mMargin):
   1. LongMarginCall(Price0, nShares, actEqy, mMargin)
   2. ShortMarginCall(Price0, nShares, actEqy, mMargin)
2. Read the attached time series data for GameStop, GME.csv, into your Python session and answer the following questions.

On January 13th, 2021, GME opened at $20.42 and closed sharply higher at $31.4 and next day it traded up further. You, as a seasoned stock trader, decided the price action was not fundamentally justified and put on a short GME position of 1000 shares at the market close on 1/14/2021. For simplicity, we will ignore borrow cost for the short GME shares.

* 1. How much cash did you have to put into your account to establish this short position under the Reg-T margin rule?
  2. Assuming the maintenance margin is at 40%, at what price would you get a margin call?
  3. Assuming you only get a margin call at the end of a trading day, which days would you have gotten a margin call at market close *within a week* of your initiation of short GME? (Use the close price for this decision.)
  4. Due to the severe volatility, your proactive broker made margin calls during the day. Which days would you have gotten an intra-day margin call? (Use the ‘High’ price for this decision.)
  5. A week later (1/22/2021), you got a margin call soon after market opened. You decided to cut your trading loss and declined margin call.
     1. How much cash in total have you put in your account up until that day since your trade initiation on 1/14/2021?
     2. What is the price to cover the short GME shares such that you would have lost the entire capital you put in?

Part II. Crude Oil Futures [50pts]

Find the enclosed data packet following 3 data files:

* *CL\_curve\_hist.csv*: 1year of WTI crude oil futures close prices.
* *Cushing\_OK\_WTI\_Spot\_Price\_FOB.csv*: spot price of WTI crude oil
* *FuturesCodeMap.csv*: futures expiring month single letter code to month number dictionary

Based on the data in the data packet, answer the following questions:

1. Plot the futures term structure based on the most recent closing prices of all futures strips. For this, you will need to figure out the way to map the column header into futures maturity terms, assuming the valuation date is 9/20/2022. Describe the term structure: is it backwardation or contango?
2. Plot the historical futures basis series for the October’22 contracts

Please submit your completed Jupyter Notebook online. No late submission will be given credit.