

Librerías y funciones

```
import numpy as np
import pandas as pd
import matplotlib.pyplot as plt
```

1. Modulo de adquisición de datos

```
class DataAdquisition:
    def __init__(self, mode = "offline", start_index = 10) -> None:
        self.mode = mode
        self.start_index = start_index
        self.current_index = start_index

        if self.mode == "offline":
            data_path = "data/AEX.csv"
            self.load_from_csv(data_path)

    def step(self):
        # Si llegamos al final:
        if not self.current_index < len(self.data) - 1:
            # Hemos llegado al final
            return []

        if self.mode == "offline":
            obs = self.get_current_data()

            #print("Current DataAdquisition index: " +
            str(self.current_index))

            self.current_index += 1

        return obs

    def get_current_data(self):
        return self.data.iloc[self.current_index]

    def load_from_csv(self, data_path):
        try:
            df = pd.read_csv(data_path)
            self.data = df
        except Exception as e:
            print("Error: " + e)
```

2. Definición de las compañías

```
class Company():
    def __init__(self, share_price = 10, option_price = 10):
        self.name = None
        self.share_price = share_price
        self.option_price = option_price
        self.n_shares = 100

        self.share: Share = Share(name = self.name, price =
share_price, quantity = self.n_shares)
        self.option: Option = Option(name = self.name, price =
option_price, expiration_date = None)
        self.deuda = 0 #
Deuda inicial de la empresa
```

3. Definición de acciones y opciones

```
class share():
    def __init__(self, name, price, quantity):
        self.name = name # Nombre de la acción
        self.price = price # Precio actual de la acción
        self.quantity = quantity # Cantidad de acciones disponibles

    def update_price(self, new_price):
        self.price = new_price # Método para actualizar el precio
de la acción

class option():
    def __init__(self, name, price, expiration_date):
        self.name = name # Nombre de la opción
        self.price = price # Precio actual de la
opción
        self.expiration_date = expiration_date # Fecha de
vencimiento de la opción

    def update_price(self, new_price):
        self.price = new_price # Método para actualizar el
precio de la opción
```

4. Definicion del mercado

```
class Market():
    def __init__(self, dataAdquisition: DataAdquisition =
DataAdquisition("offline")):
        self.dataAdquisition = dataAdquisition
        self.companies = []
        self.timestep = 0
        self.plot_created = False

    def _initialize_variables(self):
        obs = []
        self.timestep = 0
        self.plot_created = False
        self._initialize_fig()
        return obs

    def reset(self):
        obs = self._initialize_variables()
        print("Resetting...")
        return obs, False

    def step(self, action):
        # next_obs = []
        next_obs = self.dataAdquisition.step()
        rewards = {}
        total_reward = 0
        done = False
        self.dataAdquisition.step()
        self.timestep += 1
        if self.timestep > 100:
            done = True
        return next_obs, total_reward, rewards, done

    def render_old(self):
        current_data = self.dataAdquisition.get_current_data()
        if current_data is not None:
            #print("Estado actual del mercado:")
            # print(current_data)
            df = current_data
            df["High"].plot(), df["Low"].plot()
        else:
            print("No hay datos disponibles para renderizar en el
mercado.")

    def _initialize_fig(self):
        # Si el gráfico no ha sido creado todavía, crearlo y mostrar
el primer punto
```

```

self.fig = plt.figure()
self.ax = self.fig.add_subplot(211)
self.ax.set_title("Estado actual del mercado")
self.ax.set_xlabel("Paso")
self.ax.set_ylabel("Precio")
self.ax.grid()
self.plot_created = True

def render(self):

    current_data = self.dataAcquisition.get_current_data()
["Close"]
    print("Rendering..." + str(self.timestep) + " and data: " +
str(current_data))
    #print(current_data)
    #print(self.plot_created)
    #print("Timestep: " + str(self.timestep))
    if current_data is not None:
        if not self.plot_created:
            self.plot_created = True

            self.ax.plot(self.timestep, current_data, 'ro') # Crear
un punto rojo

            # self.timestep += 1
            # Si el gráfico ya fue creado, simplemente añadir un punto
al gráfico existente
            self.ax.plot(self.timestep, current_data, 'ro') # Añadir
un punto rojo
            plt.pause(0.01) # Pausa para actualizar el gráfico
        else:
            print("No hay datos disponibles para renderizar en el
mercado.")

```

5. Definición de la estrategia

```

class Strategy():
    def __init__(self):
        pass

```

6. Definición del broker

```

np.random.randint(3) # Da 0, 1 o 2 de manera aleatoria, para generar
acciones aleatorias

```

```

1
class Broker():
    def __init__(self, strategy: Strategy, capital: float = 1000,
portfolio= None):
        self.strategy = strategy
        self.capital = capital # Por defecto 1000 euros

    def predict(self, obs):
        """_summary_
        Predicts the next action:
            - 0: hold
            - 1: buy
            - 2: sell

        Returns:
            int: Hold, buy or sell action
        """
        action = np.random.randint(3)

        return action

    def buy_share(self, option):
        pass

    def sell_share(self, option):
        pass

    def buy_option(self, option):
        pass

    def sell_option(self, option):
        pass

```

7. Definicion del portfolio

El porfolio será una clase heredada del broker que llevará la gestión del capital y las acciones/optiones del broker

```

class Portfolio(Broker):
    def __init__(self, strategy: Strategy, capital: float = 1000):
        super().__init__(strategy, capital)
        self.shares = []
        self.options = []

    def update_capital(self, reward):
        self.capital += reward

```

```

def add_share(self, company):
    pass

def remove_share(self):
    pass

def add_option(self):
    pass

def remove_option(self):
    pass

```

8. Main loop

```

def main():
    # Configuración inicial. Esto en un futuro saldrá de un json
    initial_capital = 1000 # En euros
    num_episodes = 5 # numero de episodios, ya sean dias, semanas, o
    lo que sea el dt que represente el método step de la clase market

    # Se instancia la estrategia
    strategy = Strategy()

    # Se instancia el portfolio
    portfolio = Portfolio(strategy = strategy, capital =
initial_capital)

    # Se instancia el broker
    broker = Broker(strategy = strategy, capital = initial_capital,
portfolio = portfolio)

    # Definimos el mercado
    market = Market()

    for episode in range(num_episodes):
        obs, done = market.reset()
        print("Comenzando simulación...")
        while not done:
            action = broker.predict(obs)
            next_obs, total_reward, rewards, done =
market.step(action)
            obs = next_obs
            market.render()
        print("Simulación terminada con éxito")

```

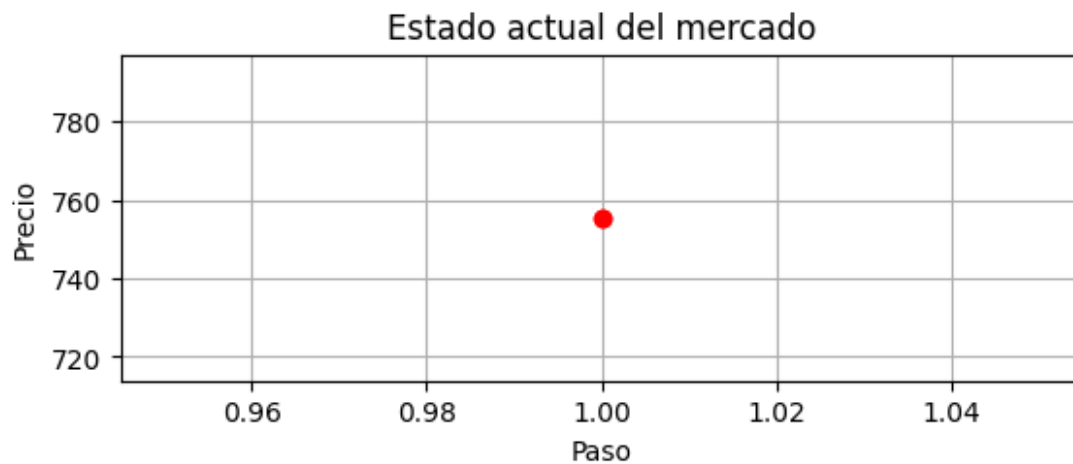
Test

```
main()
```

```
Reseting...
```

```
Comenzando simulación...
```

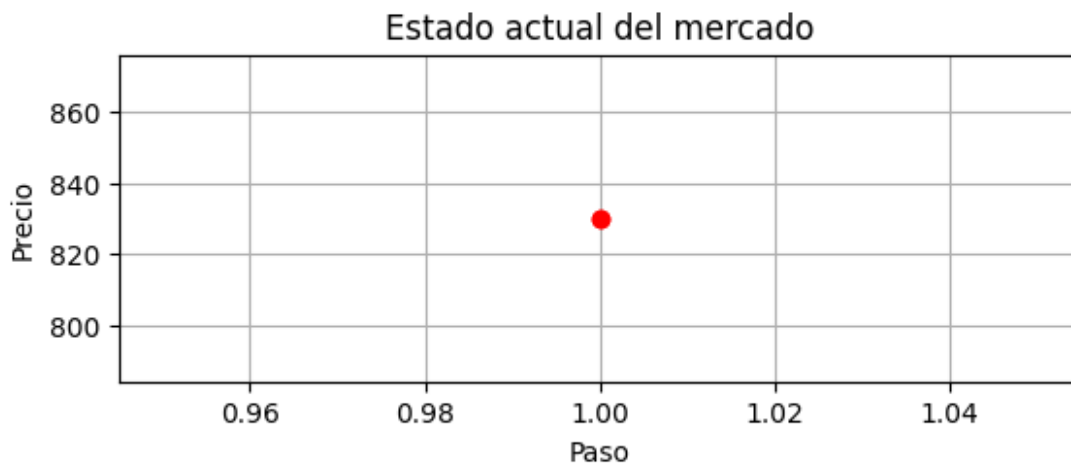
```
Rendering...1 and data: 755.450012
```



```
Rendering...2 and data: 752.599976  
Rendering...3 and data: 744.309998  
Rendering...4 and data: 741.219971  
Rendering...5 and data: 752.679993  
Rendering...6 and data: 748.289978  
Rendering...7 and data: 752.98999  
Rendering...8 and data: 756.219971  
Rendering...9 and data: 765.280029  
Rendering...10 and data: 767.609985  
Rendering...11 and data: 754.130005  
Rendering...12 and data: 767.859985  
Rendering...13 and data: 756.669983  
Rendering...14 and data: 756.349976  
Rendering...15 and data: 763.340027  
Rendering...16 and data: 761.609985  
Rendering...17 and data: 759.320007  
Rendering...18 and data: 767.710022  
Rendering...19 and data: 772.640015  
Rendering...20 and data: 768.97998  
Rendering...21 and data: 759.159973  
Rendering...22 and data: 756.599976  
Rendering...23 and data: 760.559998  
Rendering...24 and data: 768.940002  
Rendering...25 and data: 776.440002  
Rendering...26 and data: 769.890015  
Rendering...27 and data: 753.52002
```

Rendering...28 and data: 755.820007
Rendering...29 and data: 774.799988
Rendering...30 and data: 773.450012
Rendering...31 and data: 775.030029
Rendering...32 and data: 773.75
Rendering...33 and data: 779.809998
Rendering...34 and data: 792.059998
Rendering...35 and data: 792.0
Rendering...36 and data: 775.030029
Rendering...37 and data: 772.710022
Rendering...38 and data: 767.0
Rendering...39 and data: 777.789978
Rendering...40 and data: 766.210022
Rendering...41 and data: 756.849976
Rendering...42 and data: 735.039978
Rendering...43 and data: 738.210022
Rendering...44 and data: 733.98999
Rendering...45 and data: 741.76001
Rendering...46 and data: 745.429993
Rendering...47 and data: 746.049988
Rendering...48 and data: 747.109985
Rendering...49 and data: 739.710022
Rendering...50 and data: 738.890015
Rendering...51 and data: 734.929993
Rendering...52 and data: 741.51001
Rendering...53 and data: 734.929993
Rendering...54 and data: 731.719971
Rendering...55 and data: 726.640015
Rendering...56 and data: 721.73999
Rendering...57 and data: 728.789978
Rendering...58 and data: 719.669983
Rendering...59 and data: 721.75
Rendering...60 and data: 726.0
Rendering...61 and data: 737.780029
Rendering...62 and data: 733.900024
Rendering...63 and data: 736.77002
Rendering...64 and data: 727.609985
Rendering...65 and data: 719.179993
Rendering...66 and data: 722.23999
Rendering...67 and data: 714.25
Rendering...68 and data: 718.599976
Rendering...69 and data: 736.030029
Rendering...70 and data: 735.340027
Rendering...71 and data: 734.640015
Rendering...72 and data: 746.309998
Rendering...73 and data: 758.150024
Rendering...74 and data: 753.909973
Rendering...75 and data: 759.469971
Rendering...76 and data: 760.039978


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Rendering...77 and data: 765.659973
Rendering...78 and data: 761.369995
Rendering...79 and data: 765.039978
Rendering...80 and data: 770.609985
Rendering...81 and data: 776.179993
Rendering...82 and data: 781.849976
Rendering...83 and data: 786.130005
Rendering...84 and data: 789.909973
Rendering...85 and data: 789.150024
Rendering...86 and data: 793.690002
Rendering...87 and data: 785.450012
Rendering...88 and data: 787.039978
Rendering...89 and data: 783.109985
Rendering...90 and data: 780.309998
Rendering...91 and data: 779.090027
Rendering...92 and data: 775.02002
Rendering...93 and data: 781.859985
Rendering...94 and data: 778.539978
Rendering...95 and data: 778.169983
Rendering...96 and data: 785.599976
Rendering...97 and data: 806.929993
Rendering...98 and data: 817.73999
Rendering...99 and data: 820.640015
Rendering...100 and data: 822.090027
Rendering...101 and data: 824.289978
Simulación terminada con éxito
Reseting...
Comenzando simulación...
Rendering...1 and data: 830.130005
```

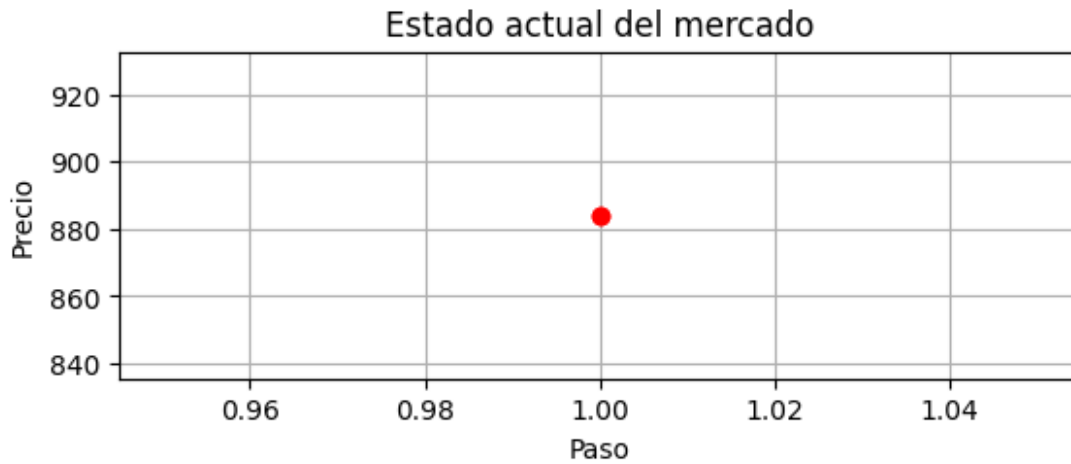


```
Rendering...2 and data: 851.77002
Rendering...3 and data: 842.619995
Rendering...4 and data: 847.590027
Rendering...5 and data: 855.849976
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Rendering...6 and data: 846.789978
Rendering...7 and data: 854.969971
Rendering...8 and data: 852.97998
Rendering...9 and data: 848.440002
Rendering...10 and data: 856.549988
Rendering...11 and data: 857.02002
Rendering...12 and data: 861.960022
Rendering...13 and data: 860.969971
Rendering...14 and data: 858.75
Rendering...15 and data: 853.76001
Rendering...16 and data: 860.539978
Rendering...17 and data: 876.340027
Rendering...18 and data: 878.400024
Rendering...19 and data: 881.780029
Rendering...20 and data: 884.049988
Rendering...21 and data: 884.169983
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Rendering...54 and data: 884.169983

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Rendering...55 and data: 884.169983
Rendering...56 and data: 884.169983
Rendering...57 and data: 884.169983
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Rendering...99 and data: 884.169983
Rendering...100 and data: 884.169983
Rendering...101 and data: 884.169983
Simulación terminada con éxito
Reseting...
```

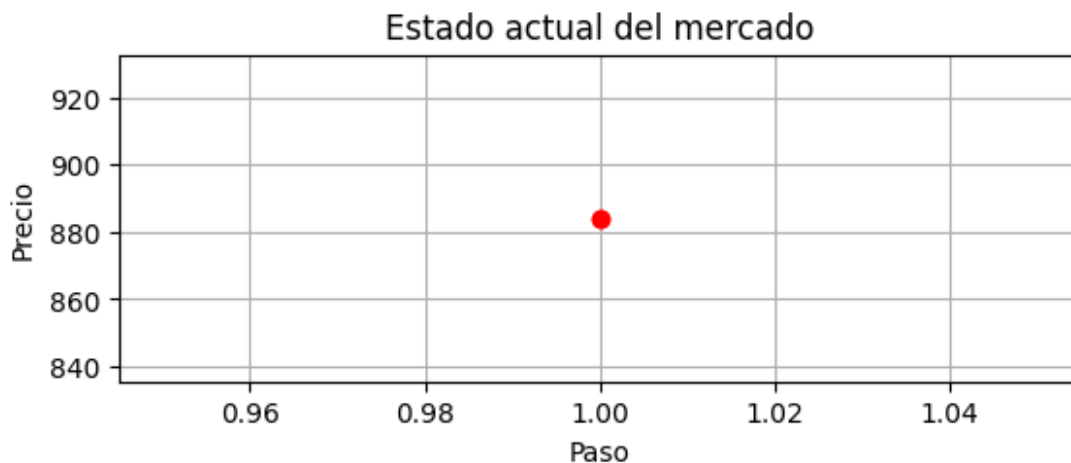
Comenzando simulación...
Rendering...1 and data: 884.169983



Rendering...2 and data: 884.169983
Rendering...3 and data: 884.169983
Rendering...4 and data: 884.169983
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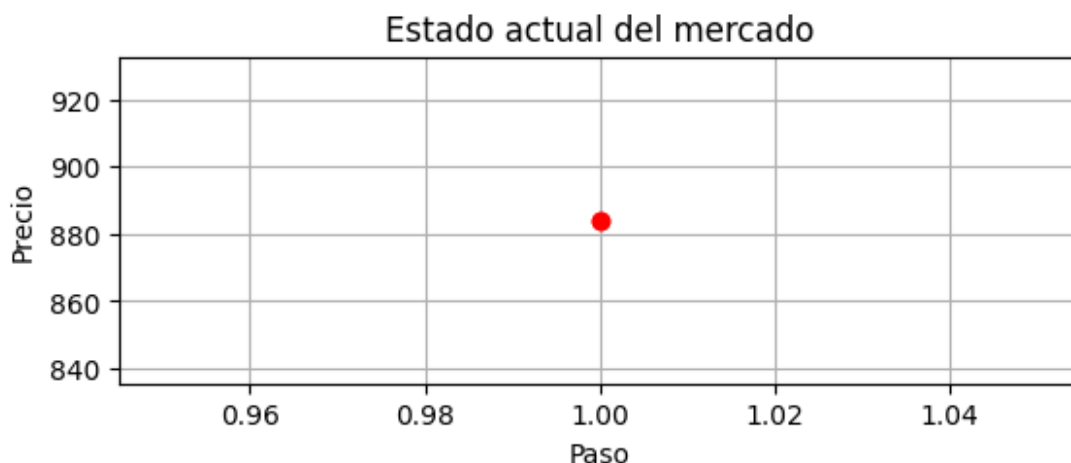
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Rendering...82 and data: 884.169983
Rendering...83 and data: 884.169983
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Rendering...86 and data: 884.169983
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Rendering...98 and data: 884.169983
Rendering...99 and data: 884.169983
Rendering...100 and data: 884.169983
Rendering...101 and data: 884.169983
Simulación terminada con éxito
Reseting...
Comenzando simulación...
Rendering...1 and data: 884.169983
```



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Rendering...2 and data: 884.169983
Rendering...3 and data: 884.169983
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Simulación terminada con éxito
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Comenzando simulación...
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Simulación terminada con éxito
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