An introduction to individual algorithmic trading project

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February 2, 2023

1 Introduction

This project aims to build a fully automated trading system with SPtrader C++ API assisted with cloud-based automation system. Back-testing engine will also be implemented with the aid of python packages. Seeking for trading edges with statistical analysis and machine learning tools. This report will go through the data source, software design and data visualization tools of cloud-based automation system.

2 Data source

2.1 HKEX

Here are the data collected from HKEX

- HKEX Stock market Daily Quotations Data
- HSI Futures, Options Daily Market Report
- HSI Market Share data
- Warrant, Inline Warrant and Callable Bull Bear Contracts data
- Stock Connect Southbound CCASS data

2.2 CME

Here are the data collected from CME

- CME Futures, Options Settlement data

2.3 Yahoo! Finance

Here are the data collected from Yahoo! Finance

- Earnings and Stock Split calendar data

3 Trading Products

Since the limitation of capitial size. For better risk control, following products are the main focus.

- Mini Heng Seng Index Futures (MHI)
- Micro E-mini Nasdaq-100 Index (MNQ)

Initial margin is set at 50000 HKD cash equivalent for every contract above.

4 Software Design and technology

4.1 Cloud-based automation system

This automation system is built and deployed on digital ocean. It is updating and delivering analysis report on daily basis. The application can be divided into two parts, service layer and model layer.
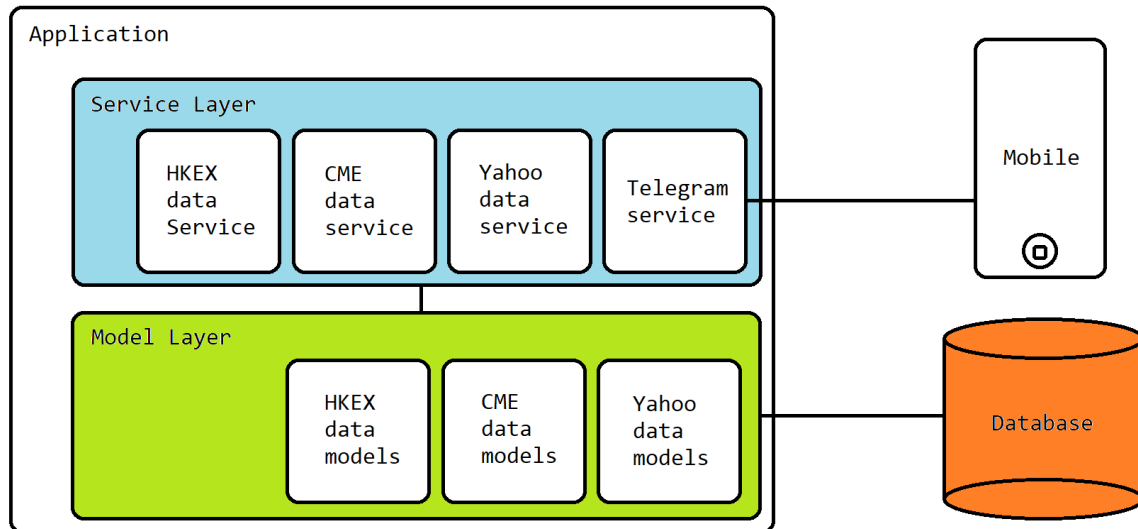

Figure 1: Architecture of automatedfinancial data application

Service layer involving download data, data transformation, report generation and report delivery with telegram API.

Figure 2: Script of HKEX warrant and CBBCs service

Model Layer contains the database schema and act as an agent let services connect with database.

Figure 3: Script of HKEX warrant and CBBCs data model

Database store all the financial data and telegram user group data

Figure 4: Screenshot of database schema

5   Signals and Data visualization

For HKEX and CME data summary, data analysis report will generated before 9:00 am and 8:30 pm. Some of the screenshot is generated below

Figure 5: Screenshot of message generated by Telegram bot

6   Performance

Here is the trade record of 2022 Nov for reference.

POSITION(S) CLOSED 平倉記錄

GLOBAL MARKET 環球市場

TRADE DATE 交易日期	ORDER NO. 交易編號	MARKET 市場	DESCRIPTION 說明		BUY 買入	SELL 沽出	TRADE/STRIKE PRICE 成交價/行使價		TRADED PREMIUM 期權金成交價	PROFIT/LOSS 盈/虧	
02/11/2022	911924	CME	MNQ	DEC 22	1		USD	11260.000000			
27/10/2022	628330	CME	MNQ	DEC 22		1	USD	11406.250000		USD	292.50
02/11/2022	914730	CME	MNQ	DEC 22		1	USD	11403.500000			
02/11/2022	911889	CME	MNQ	DEC 22	1		USD	11270.000000		USD	267.00
02/11/2022	914767	CME	MNQ	DEC 22		1	USD	11400.000000			
02/11/2022	911889	CME	MNQ	DEC 22	1		USD	11270.000000		USD	260.00
03/11/2022	970578	CME	MNQ	DEC 22	1		USD	10806.500000			
27/10/2022	628330	CME	MNQ	DEC 22		1	USD	11406.250000		USD	1,199.50
03/11/2022	970578	CME	MNQ	DEC 22	1		USD	10806.500000			
31/10/2022	773954	CME	MNQ	DEC 22		1	USD	11514.500000		USD	1,416.00
03/11/2022	970586	CME	MNQ	DEC 22		2	USD	10815.000000			
03/11/2022	958776	CME	MNQ	DEC 22	2		USD	10913.000000		USD	392.00-
03/11/2022	970586	CME	MNQ	DEC 22		1	USD	10815.000000			
03/11/2022	970578	CME	MNQ	DEC 22	1		USD	10806.500000		USD	17.00
04/11/2022	049818	CME	MNQ	DEC 22		2	USD	10776.000000			
04/11/2022	049763	CME	MNQ	DEC 22	2		USD	10766.000000		USD	40.00
04/11/2022	049819	CME	MNQ	DEC 22		1	USD	10776.000000			
04/11/2022	049763	CME	MNQ	DEC 22	1		USD	10766.000000		USD	20.00
04/11/2022	050009	CME	MNQ	DEC 22		3	USD	10776.000000			
04/11/2022	049959	CME	MNQ	DEC 22	3		USD	10766.000000		USD	60.00
07/11/2022	139652	CME	MNQ	DEC 22	1		USD	10933.000000			
07/11/2022	139290	CME	MNQ	DEC 22	1		USD	10930.000000		USD	6.00
07/11/2022	139652	CME	MNQ	DEC 22		1	USD	10933.000000			
07/11/2022	139395	CME	MNQ	DEC 22	1		USD	10929.500000		USD	7.00
07/11/2022	139653	CME	MNQ	DEC 22		1	USD	10933.000000			
07/11/2022	139493	CME	MNQ	DEC 22	1		USD	10940.000000		USD	14.00-
07/11/2022	140452	CME	MNQ	DEC 22		1	USD	10861.500000			
07/11/2022	139775	CME	MNQ	DEC 22	1		USD	10907.000000		USD	91.00-
07/11/2022	140452	CME	MNQ	DEC 22		1	USD	10861.500000			
07/11/2022	139938	CME	MNQ	DEC 22	1		USD	10888.250000		USD	53.50-
07/11/2022	143703	CME	MNQ	DEC 22		1	USD	10925.500000			
07/11/2022	143658	CME	MNQ	DEC 22	1		USD	10918.250000		USD	14.50
08/11/2022	199524	CME	MNQ	DEC 22		1	USD	11090.000000			
08/11/2022	198855	CME	MNQ	DEC 22	1		USD	11052.500000		USD	75.00
08/11/2022	199524	CME	MNQ	DEC 22		1	USD	11090.000000			
08/11/2022	199254	CME	MNQ	DEC 22	1		USD	11060.000000		USD	60.00
09/11/2022	262965	CME	MNQ	DEC 22	1		USD	10993.750000			
09/11/2022	262430	CME	MNQ	DEC 22		1	USD	11020.500000		USD	53.50
09/11/2022	262965	CME	MNQ	DEC 22	1		USD	10993.750000			
09/11/2022	262468	CME	MNQ	DEC 22		1	USD	11012.250000		USD	37.00
11/11/2022	412188	CME	MNQ	DEC 22	1		USD	11707.250000			
11/11/2022	412047	CME	MNQ	DEC 22		1	USD	11686.000000		USD	42.50-
14/11/2022	479528	CME	MNQ	DEC 22	1		USD	11786.750000			
14/11/2022	479288	CME	MNQ	DEC 22		1	USD	11757.000000		USD	59.50-
14/11/2022	479529	CME	MNQ	DEC 22	1		USD	11786.750000			
14/11/2022	479351	CME	MNQ	DEC 22		1	USD	11763.500000		USD	46.50-
15/11/2022	552911	CME	MNQ	DEC 22		1	USD	12025.000000			
15/11/2022	552577	CME	MNQ	DEC 22	1		USD	11993.250000		USD	63.50
15/11/2022	552911	CME	MNQ	DEC 22		1	USD	12025.000000			

*** To Be Continue ***

Figure 6: trade record of 2022 Nov page 1

POSITION(S) CLOSED 平倉記錄

TRADE DATE 交易日期	ORDER NO. 交易編號	MARKET 市場	DESCRIPTION 說明		BUY 買入	SELL 沽出	TRADE/STRIKE PRICE 成交價/行使價		TRADED PREMIUM 期權金成交價	PROFIT/LOSS 盈/虧	
15/11/2022	552676	CME	MNQ	DEC 22	1		USD	11985.000000		USD	80.00
21/11/2022	811196	CME	MNQ	DEC 22	1		USD	11643.000000			
21/11/2022	811055	CME	MNQ	DEC 22		1	USD	11650.500000		USD	15.00
					30	30				USD	3,284.50

LOCAL MARKET 本地市場

07/11/2022	101093	HKFE	MH	NOV 22		1	HKD	16308.000000			
07/11/2022	099303	HKFE	MH	NOV 22	1		HKD	16385.000000		HKD	770.00-
07/11/2022	102247	HKFE	MH	NOV 22		2	HKD	16388.000000			
07/11/2022	099303	HKFE	MH	NOV 22	2		HKD	16385.000000		HKD	60.00
10/11/2022	290865	HKFE	MH	NOV 22	1		HKD	15960.000000			
10/11/2022	289096	HKFE	MH	NOV 22		1	HKD	15991.000000		HKD	310.00
14/11/2022	437331	HKFE	MH	NOV 22	1		HKD	17895.000000			
14/11/2022	436761	HKFE	MH	NOV 22		1	HKD	17930.000000		HKD	350.00
14/11/2022	453316	HKFE	MH	NOV 22	1		HKD	17874.000000			
14/11/2022	453031	HKFE	MH	NOV 22		1	HKD	17840.000000		HKD	340.00-
14/11/2022	453933	HKFE	MH	NOV 22		1	HKD	17912.000000			
14/11/2022	453844	HKFE	MH	NOV 22	1		HKD	17937.000000		HKD	250.00-
21/11/2022	786063	HKFE	MH	NOV 22	1		HKD	17531.000000			
21/11/2022	784474	HKFE	MH	NOV 22		1	HKD	17460.000000		HKD	710.00-
21/11/2022	786063	HKFE	MH	NOV 22	1		HKD	17531.000000			
21/11/2022	785607	HKFE	MH	NOV 22		1	HKD	17531.000000		HKD	0.00
					9	9				HKD	1,350.00-

Figure 7: trade record of 2022 Nov page 2

7 Planning

In 2023, following task is planned to be finished

- Back-testing and performance analysis tools (python, backtrader)

- live-trading application (C++, SPtrader API)

- Implement Swing trade strategy by study of co-integration between markets (VECM, machine learning tools)

Thanks for reading and it would be grateful if I am able to present my idea directly. Please feel free to reach me via Email(chwanlouis@gmail.com) or mobile (+852 63018527)