

# 財務工程導論 Final Project 0616014 楊政道

Usage: ./a.out <選擇權csv檔案> <利率(%)> <台指買價> <台指賣價> <台指期買價> <台指期賣價>

## 0. csv格式

履約價	買權成交價	買權買價	買權賣價	賣權成交價	賣權買價	賣權賣價
6900	820	820	835	9.1	8.6	9.1
7000	740	690	740	12	12	12.5
7100	630	630	645	18	17	18
7200	550	540	550	25	26	27
7300	470	445	470	38.5	38.5	39.5
7400	397	372	397	55	55	56
7500	307	304	307	78	78	79
7600	235	231	235	109	109	110
7700	173	173	174	148	148	149
7800	120	120	121	194	195	196
7900	79	80	81	258	250	258
8000	48.5	48.5	49	323	323	332
8200	15.5	15.5	16.5	493	493	505
8400	4.1	4.1	4.2	0	0	0
8600	1	1	2	855	825	855
8800	0.6	0.6	0.9	0	0	0

## 1. ppt上的資料

月份: 2007/04													
買 權							賣 權						
履約價	時間	成交價	買價	賣價	漲跌	總量	履約價	時間	成交價	買價	賣價	漲跌	總量
6900	09:55	820	820	835	▽15	11	6900	13:43	9.1	8.6	9.1	▽2.9	1674
7000	11:27	740	690	740	△5	9	7000	13:44	12	12	12.5	▽5	959
7100	11:30	630	630	645	▽10	22	7100	13:44	18	17	18	▽8.5	2125
7200	13:36	550	540	550	△5	48	7200	13:44	25	26	27	▽12	5237
7300	13:37	470	445	470	△13	72	7300	13:44	38.5	38.5	39.5	▽11.5	6776
7400	13:40	397	372	397	△17	105	7400	13:44	55	55	56	▽14	6650
7500	13:44	307	304	307	△3	158	7500	13:44	78	78	79	▽21	7271
7600	13:44	235	231	235	▽2	335	7600	13:44	109	109	110	▽22	4500
7700	13:44	173	173	174	▽3	1816	7700	13:44	148	148	149	▽22	4786
7800	13:44	120	120	121	▽9	6088	7800	13:44	194	195	196	▽21	1043
7900	13:44	79	80	81	▽8	10637	7900	13:44	258	250	258	▽32	173
8000	13:44	48.5	48.5	49	▽6.5	13697	8000	13:28	323	323	332	▽33	175
8200	13:44	15.5	15.5	16.5	▽3	8519	8200	11:58	493	493	505	▽17	10
8400	13:41	4.1	4.1	4.2	▽0.6	1032	8400	—	—	—	—	—	—
8600	12:08	1	1	2	▽0.7	64	8600	08:47	855	825	855	▽15	7
8800	13:29	0.6	0.6	0.9	△0.1	27	8800	—	—	—	—	—	—

```
g++ HW12_0616014_楊政道.cpp
./a.out 台指選擇權.csv 1.844 7757 7758 7756 7760
```

\*\*\*\*\*

Strike Price: 6900

--Put Call Parity

----Sell a put, Sell a Taixex, Buy a call.

----- Arbitrage: 27.6

----Buy a put, Buy a Taixex, Sell a call.

-----No Arbitrage.  
 --Put Call Future Parity  
 ----Sell a put, Sell a future, Buy a call.  
**----- Arbitrage: 26.6**  
 ----Buy a put, Buy a future, Sell a call.  
 -----No Arbitrage.  
 --Theorem 3  
 ----Sell a call, Buy a stock.  
 -----No Arbitrage.  
 ----Sell a put.  
 -----No Arbitrage.  
 --Theorem 4  
 ----Buy a call, Sell a stock.  
**----- Arbitrage: 30.5949**  
 --Theorem 6  
 ----Buy a put, Buy a stock.

\*\*\*\*\*

Strike Price: 7000

--Put Call Parity  
 ----Sell a put, Sell a Taix, Buy a call.  
**----- Arbitrage: 26**  
 ----Buy a put, Buy a Taix, Sell a call.  
 -----No Arbitrage.  
 --Put Call Future Parity  
 ----Sell a put, Sell a future, Buy a call.  
**----- Arbitrage: 25**  
 ----Buy a put, Buy a future, Sell a call.  
 -----No Arbitrage.  
 --Theorem 3  
 ----Sell a call, Buy a stock.  
 -----No Arbitrage.  
 ----Sell a put.  
 -----No Arbitrage.  
 --Theorem 4  
 ----Buy a call, Sell a stock.  
**----- Arbitrage: 25.7484**  
 --Theorem 6  
 ----Buy a put, Buy a stock.

\*\*\*\*\*

Strike Price: 7100

--Put Call Parity  
 ----Sell a put, Sell a Taix, Buy a call.

----- **Arbitrage: 26**

----Buy a put, Buy a Taiex, Sell a call.

-----No Arbitrage.

--Put Call Future Parity

----Sell a put, Sell a future, Buy a call.

----- **Arbitrage: 25**

----Buy a put, Buy a future, Sell a call.

-----No Arbitrage.

--Theorem 3

----Sell a call, Buy a stock.

-----No Arbitrage.

----Sell a put.

-----No Arbitrage.

--Theorem 4

----Buy a call, Sell a stock.

----- **Arbitrage: 20.902**

--Theorem 6

----Buy a put, Buy a stock.

\*\*\*\*\*

Strike Price: 7200

--Put Call Parity

----Sell a put, Sell a Taiex, Buy a call.

----- **Arbitrage: 30**

----Buy a put, Buy a Taiex, Sell a call.

-----No Arbitrage.

--Put Call Future Parity

----Sell a put, Sell a future, Buy a call.

----- **Arbitrage: 29**

----Buy a put, Buy a future, Sell a call.

-----No Arbitrage.

--Theorem 3

----Sell a call, Buy a stock.

-----No Arbitrage.

----Sell a put.

-----No Arbitrage.

--Theorem 4

----Buy a call, Sell a stock.

----- **Arbitrage: 16.0555**

--Theorem 6

----Buy a put, Buy a stock.

\*\*\*\*\*

Strike Price: 7300

--Put Call Parity  
 ----Sell a put, Sell a Taiex, Buy a call.  
 ----- **Arbitrage: 22.5**  
 ----Buy a put, Buy a Taiex, Sell a call.  
 -----No Arbitrage.  
 --Put Call Future Parity  
 ----Sell a put, Sell a future, Buy a call.  
 ----- **Arbitrage: 21.5**  
 ----Buy a put, Buy a future, Sell a call.  
 -----No Arbitrage.  
 --Theorem 3  
 ----Sell a call, Buy a stock.  
 -----No Arbitrage.  
 ----Sell a put.  
 -----No Arbitrage.  
 --Theorem 4  
 ----Buy a call, Sell a stock.  
 -----No Arbitrage.  
 --Theorem 6  
 ----Buy a put, Buy a stock.

\*\*\*\*\*

Strike Price: 7400  
 --Put Call Parity  
 ----Sell a put, Sell a Taiex, Buy a call.  
 ----- **Arbitrage: 12**  
 ----Buy a put, Buy a Taiex, Sell a call.  
 -----No Arbitrage.  
 --Put Call Future Parity  
 ----Sell a put, Sell a future, Buy a call.  
 ----- **Arbitrage: 11**  
 ----Buy a put, Buy a future, Sell a call.  
 -----No Arbitrage.  
 --Theorem 3  
 ----Sell a call, Buy a stock.  
 -----No Arbitrage.  
 ----Sell a put.  
 -----No Arbitrage.  
 --Theorem 4  
 ----Buy a call, Sell a stock.  
 -----No Arbitrage.  
 --Theorem 6  
 ----Buy a put, Buy a stock.

\*\*\*\*\*

Strike Price: 7500

--Put Call Parity

----Sell a put, Sell a Taix, Buy a call.

----- **Arbitrage: 25**

----Buy a put, Buy a Taix, Sell a call.

-----No Arbitrage.

--Put Call Future Parity

----Sell a put, Sell a future, Buy a call.

----- **Arbitrage: 24**

----Buy a put, Buy a future, Sell a call.

-----No Arbitrage.

--Theorem 3

----Sell a call, Buy a stock.

-----No Arbitrage.

----Sell a put.

-----No Arbitrage.

--Theorem 4

----Buy a call, Sell a stock.

-----No Arbitrage.

--Theorem 6

----Buy a put, Buy a stock.

\*\*\*\*\*

Strike Price: 7600

--Put Call Parity

----Sell a put, Sell a Taix, Buy a call.

----- **Arbitrage: 28**

----Buy a put, Buy a Taix, Sell a call.

-----No Arbitrage.

--Put Call Future Parity

----Sell a put, Sell a future, Buy a call.

----- **Arbitrage: 27**

----Buy a put, Buy a future, Sell a call.

-----No Arbitrage.

--Theorem 3

----Sell a call, Buy a stock.

-----No Arbitrage.

----Sell a put.

-----No Arbitrage.

--Theorem 4

----Buy a call, Sell a stock.

-----No Arbitrage.

--Theorem 6

----Buy a put, Buy a stock.

\*\*\*\*\*

Strike Price: 7700

--Put Call Parity

----Sell a put, Sell a Taixex, Buy a call.

----- **Arbitrage: 28**

----Buy a put, Buy a Taixex, Sell a call.

-----No Arbitrage.

--Put Call Future Parity

----Sell a put, Sell a future, Buy a call.

----- **Arbitrage: 27**

----Buy a put, Buy a future, Sell a call.

-----No Arbitrage.

--Theorem 3

----Sell a call, Buy a stock.

-----No Arbitrage.

----Sell a put.

-----No Arbitrage.

--Theorem 4

----Buy a call, Sell a stock.

-----No Arbitrage.

--Theorem 6

----Buy a put, Buy a stock.

\*\*\*\*\*

Strike Price: 7800

--Put Call Parity

----Sell a put, Sell a Taixex, Buy a call.

----- **Arbitrage: 28**

----Buy a put, Buy a Taixex, Sell a call.

-----No Arbitrage.

--Put Call Future Parity

----Sell a put, Sell a future, Buy a call.

----- **Arbitrage: 27**

----Buy a put, Buy a future, Sell a call.

-----No Arbitrage.

--Theorem 3

----Sell a call, Buy a stock.

-----No Arbitrage.

----Sell a put.

-----No Arbitrage.

--Theorem 4

----Buy a call, Sell a stock.

-----No Arbitrage.

--Theorem 6

----Buy a put, Buy a stock.

\*\*\*\*\*

Strike Price: 7900

--Put Call Parity

----Sell a put, Sell a Taix, Buy a call.

----- **Arbitrage: 23**

----Buy a put, Buy a Taix, Sell a call.

-----No Arbitrage.

--Put Call Future Parity

----Sell a put, Sell a future, Buy a call.

----- **Arbitrage: 22**

----Buy a put, Buy a future, Sell a call.

-----No Arbitrage.

--Theorem 3

----Sell a call, Buy a stock.

-----No Arbitrage.

----Sell a put.

-----No Arbitrage.

--Theorem 4

----Buy a call, Sell a stock.

-----No Arbitrage.

--Theorem 6

----Buy a put, Buy a stock.

\*\*\*\*\*

Strike Price: 8000

--Put Call Parity

----Sell a put, Sell a Taix, Buy a call.

----- **Arbitrage: 28**

----Buy a put, Buy a Taix, Sell a call.

-----No Arbitrage.

--Put Call Future Parity

----Sell a put, Sell a future, Buy a call.

----- **Arbitrage: 27**

----Buy a put, Buy a future, Sell a call.

-----No Arbitrage.

--Theorem 3

----Sell a call, Buy a stock.

-----No Arbitrage.

----Sell a put.

-----No Arbitrage.  
--Theorem 4  
----Buy a call, Sell a stock.  
-----No Arbitrage.  
--Theorem 6  
----Buy a put, Buy a stock.  
\*\*\*\*\*

Strike Price: 8200  
--Put Call Parity  
----Sell a put, Sell a Taiex, Buy a call.  
----- **Arbitrage: 30.5**  
----Buy a put, Buy a Taiex, Sell a call.  
-----No Arbitrage.  
--Put Call Future Parity  
----Sell a put, Sell a future, Buy a call.  
----- **Arbitrage: 29.5**  
----Buy a put, Buy a future, Sell a call.  
-----No Arbitrage.  
--Theorem 3  
----Sell a call, Buy a stock.  
-----No Arbitrage.  
----Sell a put.  
-----No Arbitrage.  
--Theorem 4  
----Buy a call, Sell a stock.  
-----No Arbitrage.  
--Theorem 6  
----Buy a put, Buy a stock.  
\*\*\*\*\*

Strike Price: 8400  
--Put Call Parity  
----No Price  
--Put Call Future Parity  
----No Price  
--Theorem 3  
----Sell a call, Buy a stock.  
-----No Arbitrage.  
----Sell a put.  
-----No Price  
--Theorem 4  
----Buy a call, Sell a stock.  
-----No Arbitrage.



--Theorem 6

----No Price

\*\*\*\*\*

Strike Price: 8600

--Put Call Parity

----Sell a put, Sell a Taix, Buy a call.

-----No Arbitrage.

----Buy a put, Buy a Taix, Sell a call.

-----No Arbitrage.

--Put Call Future Parity

----Sell a put, Sell a future, Buy a call.

-----No Arbitrage.

----Buy a put, Buy a future, Sell a call.

-----No Arbitrage.

--Theorem 3

----Sell a call, Buy a stock.

-----No Arbitrage.

----Sell a put.

-----No Arbitrage.

--Theorem 4

----Buy a call, Sell a stock.

-----No Arbitrage.

--Theorem 6

----Buy a put, Buy a stock.

\*\*\*\*\*

Strike Price: 8800

--Put Call Parity

----No Price

--Put Call Future Parity

----No Price

--Theorem 3

----Sell a call, Buy a stock.

-----No Arbitrage.

----Sell a put.

-----No Price

--Theorem 4

----Buy a call, Sell a stock.

-----No Arbitrage.

--Theorem 6

----No Price

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## 2. 20190629資料

買 權 (CALL)								賣 權 (PUT)							
買進	賣出	成交	漲跌	未平倉	總量	時間	履約價	買進	賣出	成交	漲跌	未平倉	總量	時間	
500.00	--	--	0.00	612	--	--	10000	16.50	20.00	20.00	2.00	14032	262	04:54:22	
333.00	--	--	0.00	624	--	--	10100	23.50	26.00	23.00	-2.00	13515	459	04:29:47	
131.00	430.00	426.00	14.00	1012	10	20:03:20	10200	34.00	35.00	35.00	-0.50	23935	857	04:53:45	
325.00	342.00	337.00	12.00	2537	51	00:58:16	10300	49.00	49.50	49.00	-2.00	10330	859	04:59:03	
238.00	268.00	245.00	-6.00	4485	63	03:53:25	10400	71.00	72.00	72.00	0.00	10502	1158	04:59:34	
185.00	189.00	188.00	8.00	6630	533	04:59:34	10500	97.00	102.00	97.00	-4.00	9956	1264	04:59:34	
124.00	128.00	125.00	3.00	8253	1015	04:58:26	10600	133.00	145.00	133.00	-11.00	5531	641	04:53:19	
84.00	85.00	84.00	5.00	11611	2779	04:59:33	10700	194.00	213.00	203.00	5.00	2893	201	04:06:12	
50.00	51.00	51.00	3.00	30127	2896	04:59:57	10800	247.00	279.00	263.00	-12.00	1316	71	04:18:03	
30.50	31.50	31.00	3.50	19665	1665	04:59:57	10900	116.00	--	344.00	-6.00	968	19	04:14:34	
17.00	19.00	18.00	3.50	22753	1499	04:57:13	11000	400.00	458.00	426.00	-11.00	689	42	17:53:46	
10.00	11.00	11.00	3.00	18592	320	04:58:42	11100	200.00	--	535.00	5.00	298	2	03:53:25	
4.60	7.00	6.00	1.30	4208	130	01:23:51	11200	238.00	--	--	0.00	86	--	--	
2.50	4.10	4.10	1.10	2393	10	04:33:10	11300	169.00	--	--	0.00	164	--	--	
1.00	10.00	2.00	0.10	1617	1	17:51:46	11400	189.00	--	--	0.00	37	--	--	
--	1.80	1.90	0.20	732	5	16:58:33	11500	62.00	--	--	0.00	115	--	--	
0.60	2.20	0.80	-0.20	688	1	15:02:57	11600	54.00	--	--	0.00	2	--	--	

```
g++ HW12_0616014_楊政道.cpp
./a.out 台指選擇權20190629.csv 1.844 10719.08 10788.08 10730.83 10730.83
```

### 結果

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Strike Price: 10200

--Put Call Parity

----Sell a put, Sell a Taiex, Buy a call.

----- Arbitrage: 120.08

----Buy a put, Buy a Taiex, Sell a call.

-----No Arbitrage.

--Put Call Future Parity

----Sell a put, Sell a future, Buy a call.

----- Arbitrage: 131.83

----Buy a put, Buy a future, Sell a call.

-----No Arbitrage.

--Theorem 3

----Sell a call, Buy a stock.

-----No Arbitrage.

----Sell a put.

-----No Arbitrage.

--Theorem 4

----Buy a call, Sell a stock.

----- **Arbitrage: 102.742**

--Theorem 6

----Buy a put, Buy a stock.

\*\*\*\*\*

Strike Price: 10300

--Put Call Parity

----Sell a put, Sell a Taiex, Buy a call.

----- **Arbitrage: 123.08**

----Buy a put, Buy a Taiex, Sell a call.

-----No Arbitrage.

--Put Call Future Parity

----Sell a put, Sell a future, Buy a call.

----- **Arbitrage: 134.83**

----Buy a put, Buy a future, Sell a call.

-----No Arbitrage.

--Theorem 3

----Sell a call, Buy a stock.

-----No Arbitrage.

----Sell a put.

-----No Arbitrage.

--Theorem 4

----Buy a call, Sell a stock.

----- **Arbitrage: 90.8955**

--Theorem 6

----Buy a put, Buy a stock.

\*\*\*\*\*

Strike Price: 10400

--Put Call Parity

----Sell a put, Sell a Taiex, Buy a call.

----- **Arbitrage: 119.08**

----Buy a put, Buy a Taiex, Sell a call.

-----No Arbitrage.

--Put Call Future Parity

----Sell a put, Sell a future, Buy a call.

----- **Arbitrage: 130.83**

----Buy a put, Buy a future, Sell a call.

-----No Arbitrage.

--Theorem 3

----Sell a call, Buy a stock.

-----No Arbitrage.

----Sell a put.

-----No Arbitrage.

--Theorem 4

----Buy a call, Sell a stock.

----- **Arbitrage: 65.0491**

--Theorem 6

----Buy a put, Buy a stock.

\*\*\*\*\*

Strike Price: 10500

--Put Call Parity

----Sell a put, Sell a Taiex, Buy a call.

----- **Arbitrage: 124.08**

----Buy a put, Buy a Taiex, Sell a call.

-----No Arbitrage.

--Put Call Future Parity

----Sell a put, Sell a future, Buy a call.

----- **Arbitrage: 135.83**

----Buy a put, Buy a future, Sell a call.

-----No Arbitrage.

--Theorem 3

----Sell a call, Buy a stock.

-----No Arbitrage.

----Sell a put.

-----No Arbitrage.

--Theorem 4

----Buy a call, Sell a stock.

----- **Arbitrage: 44.2026**

--Theorem 6

----Buy a put, Buy a stock.

\*\*\*\*\*

Strike Price: 10600

--Put Call Parity

----Sell a put, Sell a Taiex, Buy a call.

----- **Arbitrage: 121.08**

----Buy a put, Buy a Taiex, Sell a call.

-----No Arbitrage.

--Put Call Future Parity

----Sell a put, Sell a future, Buy a call.

----- **Arbitrage: 132.83**

----Buy a put, Buy a future, Sell a call.

-----No Arbitrage.

--Theorem 3

----Sell a call, Buy a stock.

-----No Arbitrage.

----Sell a put.

-----No Arbitrage.

--Theorem 4

----Buy a call, Sell a stock.

----- **Arbitrage: 5.35616**

--Theorem 6

----Buy a put, Buy a stock.

\*\*\*\*\*

Strike Price: 10700

--Put Call Parity

----Sell a put, Sell a Taiex, Buy a call.

----- **Arbitrage: 125.08**

----Buy a put, Buy a Taiex, Sell a call.

-----No Arbitrage.

--Put Call Future Parity

----Sell a put, Sell a future, Buy a call.

----- **Arbitrage: 136.83**

----Buy a put, Buy a future, Sell a call.

-----No Arbitrage.

--Theorem 3

----Sell a call, Buy a stock.

-----No Arbitrage.

----Sell a put.

-----No Arbitrage.

--Theorem 4

----Buy a call, Sell a stock.

-----No Arbitrage.

--Theorem 6

----Buy a put, Buy a stock.

\*\*\*\*\*

Strike Price: 10800

--Put Call Parity

----Sell a put, Sell a Taiex, Buy a call.

----- **Arbitrage: 112.08**

----Buy a put, Buy a Taiex, Sell a call.

-----No Arbitrage.

--Put Call Future Parity

----Sell a put, Sell a future, Buy a call.

----- **Arbitrage: 123.83**

----Buy a put, Buy a future, Sell a call.

-----No Arbitrage.

--Theorem 3

----Sell a call, Buy a stock.

-----No Arbitrage.

----Sell a put.

-----No Arbitrage.

--Theorem 4

----Buy a call, Sell a stock.

-----No Arbitrage.

--Theorem 6

----Buy a put, Buy a stock.

\*\*\*\*\*

Strike Price: 10900

--Put Call Parity  
----No Price  
--Put Call Future Parity  
----No Price  
--Theorem 3  
----Sell a call, Buy a stock.  
-----No Arbitrage.  
----Sell a put.  
-----No Price  
--Theorem 4  
----Buy a call, Sell a stock.  
-----No Arbitrage.  
--Theorem 6  
----No Price

\*\*\*\*\*

Strike Price: 11000

--Put Call Parity  
----Sell a put, Sell a Taiex, Buy a call.  
----- **Arbitrage: 97.08**  
----Buy a put, Buy a Taiex, Sell a call.  
-----No Arbitrage.  
--Put Call Future Parity  
----Sell a put, Sell a future, Buy a call.  
----- **Arbitrage: 108.83**  
----Buy a put, Buy a future, Sell a call.  
-----No Arbitrage.  
--Theorem 3  
----Sell a call, Buy a stock.  
-----No Arbitrage.  
----Sell a put.  
-----No Arbitrage.  
--Theorem 4  
----Buy a call, Sell a stock.  
-----No Arbitrage.  
--Theorem 6  
----Buy a put, Buy a stock.

\*\*\*\*\*

Strike Price: 11100

--Put Call Parity  
----No Price  
--Put Call Future Parity  
----No Price  
--Theorem 3  
----Sell a call, Buy a stock.  
-----No Arbitrage.  
----Sell a put.

-----No Price  
--Theorem 4  
----Buy a call, Sell a stock.  
-----No Arbitrage.  
--Theorem 6  
----No Price

\*\*\*\*\*

Strike Price: 11200  
--Put Call Parity  
----No Price  
--Put Call Future Parity  
----No Price  
--Theorem 3  
----Sell a call, Buy a stock.  
-----No Arbitrage.  
----Sell a put.  
-----No Price  
--Theorem 4  
----Buy a call, Sell a stock.  
-----No Arbitrage.  
--Theorem 6  
----No Price

\*\*\*\*\*

Strike Price: 11300  
--Put Call Parity  
----No Price  
--Put Call Future Parity  
----No Price  
--Theorem 3  
----Sell a call, Buy a stock.  
-----No Arbitrage.  
----Sell a put.  
-----No Price  
--Theorem 4  
----Buy a call, Sell a stock.  
-----No Arbitrage.  
--Theorem 6  
----No Price

\*\*\*\*\*

Strike Price: 11400  
--Put Call Parity  
----No Price  
--Put Call Future Parity  
----No Price  
--Theorem 3  
----Sell a call, Buy a stock.

-----No Arbitrage.

----Sell a put.

-----No Price

--Theorem 4

----Buy a call, Sell a stock.

-----No Arbitrage.

--Theorem 6

----No Price

\*\*\*\*\*