

# 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> <台指期貨買價> <台指期貨賣價>

## 1. ppt上的資料

月份: 2007/04													
買 權							賣 權						
應約價	時間	成交價	買價	賣價	漲跌	總量	應約價	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
8100	13:44	15.5	15.5	16.5	▽3	8519	8100	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
```

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Strike Price: 6900

--Put Call Parity

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

----- **Arbitrage: 27.6**

----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: 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: 20**

--Theorem 6

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

\*\*\*\*\*

Strike Price: 7000

--Put Call Parity

----Sell a put, Sell a Taiex, 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: 15**

--Theorem 6

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

\*\*\*\*\*

Strike Price: 7100

--Put Call Parity

----Sell a put, Sell a Taiex, 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: 10**

--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: 5**

--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.

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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 Taiex, Buy a call.

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

----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: 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.

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Strike Price: 7700

--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.

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Strike Price: 7800

--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.

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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.

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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.

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Strike Price: 8200

--Put Call Parity

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

----- **Arbitrage: 30.5**

----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: 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.  
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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  
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Strike Price: 8600  
--Put Call Parity  
----Sell a put, Sell a Taiex, Buy a call.  
-----No Arbitrage.  
----Buy a put, Buy a Taiex, 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 stack.

-----No Arbitrage.

----Sell a put.

-----No Arbitrage.

--Theorem 4

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

----- **Arbitrage: 87.08**

--Theorem 6

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

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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 stack.

-----No Arbitrage.

----Sell a put.

-----No Arbitrage.

--Theorem 4

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

----- **Arbitrage: 75.08**

--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 stack.

-----No Arbitrage.

----Sell a put.

-----No Arbitrage.

--Theorem 4

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

----- **Arbitrage: 49.08**

--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: 28.08**

--Theorem 6

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

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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.

-----No Arbitrage.

--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.

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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 stack.  
-----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 stack.  
-----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 stack.

-----No Arbitrage.

----Sell a put.

-----No Price

--Theorem 4

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

-----No Arbitrage.

--Theorem 6

----No Price

\*\*\*\*\*