Practical Considerations and Risks - Portfolio Trading, Index Arbitrage, and Dispersion Trading

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Agenda

Portfolio Trading (cash equity – agency trading)
Index Arbitrage (cash equity – principal trading)
Dispersion Trading (equity derivatives – market making)
Agenda

This is NOT a SFC presentation
This is NOT a mathematics class
Please raise questions anytime
Portfolio Trading

Agency Business

Portfolio Trading ↔ Programing Trading ↔ Agency Execution

Who / What are involved

- Human (internal / external dealers; facilitation traders)
- Robot (computer programs; algorithmic trading)
- Access (FIXs and DMAs)
- Venue (Exchange, crossing engine, dark pool, OTC)
Portfolio Trading

Excellent training for junior trader

- Regulation
- Trading mechanism
- Market infrastructure
- Expectation from clients / sales / bosses
- Friendship with FO, MO, and BO (plus controllers and compliance)
- Multitasking (cross markets and multiple clients)
Portfolio Trading

Business

- Portfolio sales do all the client facing work
- Portfolio traders
  - Orders are in the system correctly (Excel, Bloomberg, FIX, phone call, etc)
  - Follow client’s instruction
  - Timely communication – nobody likes surprises
  - Seamless post trading reporting and settlement
  - Regulatory compliance (execution, booking, allocation, restriction list)
Portfolio Trading

Risks

- System failure (always have third party backup)
- Algo (know your tool; kill switch)
- Booking error (wrong allocation, wrong investor account)
- Human error from manual operation
- Settlement (unsuccessful DVP; wrong client position)
Portfolio Trading

Advice

- Everybody makes mistakes
  - report early and ask for help!
- Best execution to client
  - you are doing agency business!
- Comply and Respect execution policy and regulation
  - don’t play in grey area!
Index Arbitrage

Using component stocks to reconstruct an index

Index arbitrage = Long/Short position in stocks + Short/Long position in index futures

Business

- Principal trading
- Source of inventory for stock lending
Index Arbitrage

Index arbitrage => difference between the values of

1) stock index*
2) futures implied stock index*

*(1) is built according to the methodology provided by the index service provider
*(2) is the stock index value implied by the futures contract

Trading

- Buy stock basket and sell futures when $(2) - (1) - \text{costs}^* > 0$
- Sell stock basket and buy futures when $(1) - (2) - \text{costs}^* > 0$

* Costs = internal/external brokerage fees, ticket fee, stamp, levy, etc.
Index Arbitrage

Stock basket construction

- Same size as futures position
- Hang Seng futures price = 25,000; multiplier x HKD 50
- Basket size = HKD 1,250,000 per 1 futures contract
## Index Arbitrage

<table>
<thead>
<tr>
<th>Code</th>
<th>Stock</th>
<th>Index Weight</th>
<th>Price</th>
<th># Shares</th>
</tr>
</thead>
<tbody>
<tr>
<td>5 HK</td>
<td>HSBC</td>
<td>13.73%</td>
<td>82.65</td>
<td>2,077</td>
</tr>
<tr>
<td>700 HK</td>
<td>Tencent</td>
<td>8.61%</td>
<td>125.8</td>
<td>856</td>
</tr>
<tr>
<td>941 HK</td>
<td>China Mobile</td>
<td>7.53%</td>
<td>101.1</td>
<td>931</td>
</tr>
<tr>
<td>1299 HK</td>
<td>AIA</td>
<td>6.29%</td>
<td>42.85</td>
<td>1,835</td>
</tr>
<tr>
<td>939 HK</td>
<td>CCB</td>
<td>6.08%</td>
<td>5.93</td>
<td>12,816</td>
</tr>
<tr>
<td>etc (total 50 stocks)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

### HSI Oct 14 Futures

<table>
<thead>
<tr>
<th># Contract</th>
<th>Price</th>
<th>Amount (HKD)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>25,000</td>
<td>1,250,000</td>
</tr>
</tbody>
</table>
Index Arbitrage

Futures implied stock index

\[ \text{Futures} = [\text{Index} - \text{PV(Dividend)}] \times e^{r(T-t)} \]

- Dividend => stock component dividends
- \( r \) => funding rate
- \( T-t \) => residual life of futures contract
- Solve for Index
Index Arbitrage

Risks (set-up)

- Do not rely on a single data source
- Build your own index to avoid delay
- Present all parameters clearly on screen
- Try to move away from spreadsheet
- Know the latest technology (The Need for Speed!)
- Clear compliance on restriction list
- Test your trading system for speed and accuracy
- Make sure your finger is not FAT!
Index Arbitrage

Risks (execution / operation)

- **Wrong dividend assumption**
  - wrong futures implied stock index

- **Fail to update database**
  - suspension / split / merge / change code / lot size / weight in index, etc.…

- **Fail to understand the funding status of the platform**
  - Make sure you secure your funding for your position

- **Robotic behavior**
  - blindly follow the green light

- **Bid-offer spread**
  - what the green light showing against?

- **Liquidity of small stocks in index**
Index Arbitrage

Risks (execution / operation)

- Fail to understand the logic of index arbitrage
  - Long stocks short futures -> cash outflow for margin when market goes up
  - Short stocks long futures -> chance to have your stock loan recalled when market goes down

- Futures rollover
  - Avoid last minute rollover
  - Triple check all rollovers are done on expiry day

- Future position limit issue
  - Unwind; swap to forward or ETF (at fair price)

- Do not shock the market when you do the unwinding
  - No market manipulation

- Do not shock the market when you do index name change
  - No market manipulation
Dispersion Trading

Using options on the component stocks to reconstruct an index option

Also known as “Correlation Trading” and “Volatility Arbitrage”

Dispersion trading  =  Long position in stock options
                   +  Short position in index options
Dispersion Trading

Business

- Backbone strategy for option market makers
- Option inventory warehouse
- Facilitation of client activities
Dispersion Trading

Dispersion  =  spreading out
Correlation  =  going together

\[
\text{Dispersion} = \sum \alpha_i \sigma_i^2 - \sigma_1^2
\]

\(\alpha_i\)  =  weight of component stock \(i\) in index \(I\)
\(\sigma_i\)  =  volatility of component stock \(i\) in index \(I\)
\(\sigma_1\)  =  volatility of index \(I\)
## Dispersion Trading

<table>
<thead>
<tr>
<th>Stock</th>
<th>Weight</th>
<th>Volatility</th>
<th>Weight x Volatility Square</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>16%</td>
<td>20.0%</td>
<td>0.0064</td>
</tr>
<tr>
<td>B</td>
<td>22%</td>
<td>24.0%</td>
<td>0.0127</td>
</tr>
<tr>
<td>C</td>
<td>18%</td>
<td>27.0%</td>
<td>0.0131</td>
</tr>
<tr>
<td>D</td>
<td>25%</td>
<td>30.0%</td>
<td>0.0225</td>
</tr>
<tr>
<td>E</td>
<td>19%</td>
<td>23.0%</td>
<td>0.0101</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>100%</strong></td>
<td><strong>20.0%</strong></td>
<td><strong>0.0647</strong></td>
</tr>
</tbody>
</table>

### Index

- **Dispersion**: 0.1573
- **Index Volatility**: 20.0%

<table>
<thead>
<tr>
<th>Dispersion</th>
<th>0.1573</th>
<th>Index Volatility</th>
<th>20.0%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Dispersion</td>
<td>0.1847</td>
<td>Index Volatility</td>
<td>17.5%</td>
</tr>
<tr>
<td>Dispersion</td>
<td>0.1573</td>
<td>Index Volatility</td>
<td>20.0%</td>
</tr>
<tr>
<td>Dispersion</td>
<td>0.1188</td>
<td>Index Volatility</td>
<td>22.5%</td>
</tr>
</tbody>
</table>
Dispersion Trading

Operation

- Buy optionality of each stock component
- Sell optionality of the index
- In theory you trade gamma until expiry of all options
- In real life you trade delta, gamma, and vega
- Options in the book are unlikely to expire at the same time
- Options in the book are unlikely to be stable due to change in volatility, spot, time, and client activities
Dispersion Trading

Good day

- All stocks move in different directions (dispersed movement)
- Index does not move

Bad day

- Index moves
- Stock components with under-weighed gamma move
- Stock components with over-weighed gamma do not move
Dispersion Trading

Risks

- Tracking error from imperfect portfolio
- Bad positions from client activities
  - clients may skew / screw your book
- Non-model base trading
  - trader’s discretion; suggestion from boss
- Slippage in hedging
  - execution issues, unavailability of stock borrow
Dispersion Trading

Risks

- Unstable option positions from expiry
- Unstable gamma positions due to changes in spot
- Unstable gamma positions from near the strike expiry
- Unstable delta, gamma and vega positions due to remarking of volatility curve
- Other issues (Mis-match in volatility smile, implied delta, etc)
Q&A
Thank You

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