Trading
Singapore MSCI Index Futures

A Trading Case Study
Obligations at Maturity

Physical delivery

- A **deliverable** futures contract stipulates that the long will pay the agreed-upon price to the seller, who in turn will deliver the underlying asset to the buyer, a process called **delivery**.

Cash settlement

- An alternative procedure, called **cash settlement**, permits the buyer and seller to pay the **net cash value** of the position on the delivery date.
## Futures Expiration Month

<table>
<thead>
<tr>
<th>Code</th>
<th>Month</th>
</tr>
</thead>
<tbody>
<tr>
<td>F</td>
<td>January</td>
</tr>
<tr>
<td>G</td>
<td>February</td>
</tr>
<tr>
<td>H</td>
<td>March</td>
</tr>
<tr>
<td>J</td>
<td>April</td>
</tr>
<tr>
<td>K</td>
<td>May</td>
</tr>
<tr>
<td>M</td>
<td>June</td>
</tr>
<tr>
<td>N</td>
<td>July</td>
</tr>
<tr>
<td>Q</td>
<td>August</td>
</tr>
<tr>
<td>U</td>
<td>September</td>
</tr>
<tr>
<td>V</td>
<td>October</td>
</tr>
<tr>
<td>X</td>
<td>November</td>
</tr>
<tr>
<td>Z</td>
<td>December</td>
</tr>
</tbody>
</table>
Codes for Maturity Months

FGH JKM NQU VXZ

Fearsome gorillas have just killed many nyalas quietly, unleashing very xenophobic zeal.

# Example of Physical Delivery: Wheat Futures

<table>
<thead>
<tr>
<th>Contract Size</th>
<th>5,000 bushels (~ 136 Metric Tons)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Deliverable Grade</td>
<td>#2 Soft Red Winter at contract price, #1 Soft Red Winter at a 3 cent premium, other deliverable grades listed in Rule 14104.</td>
</tr>
<tr>
<td>Pricing Unit</td>
<td>Cents per bushel</td>
</tr>
<tr>
<td>Tick Size (minimum fluctuation)</td>
<td>1/4 of one cent per bushel ($12.50 per contract)</td>
</tr>
<tr>
<td>Contract Months/Symbols</td>
<td>March (H), May (K), July (N), September (U) &amp; December (Z)</td>
</tr>
<tr>
<td>Last Trade Date</td>
<td>The business day prior to the 15th calendar day of the contract month.</td>
</tr>
<tr>
<td>Last Delivery Date</td>
<td>Second business day following the last trading day of the delivery month.</td>
</tr>
</tbody>
</table>
Futures Exchanges

- **CME Group**
- **Eurex**
- **Osaka Securities Exchange** (now part of JPX Group)
- **Hong Kong Exchange**
- **Korea Exchange**
- **Taiwan Exchange**
- **Singapore Exchange** (known as SIMEX before demutualization)
When the farmers sell futures contracts, they do not sell directly to the buyers. Rather they sell to the clearing house of the futures exchange.

The clearing house guarantees that all of the traders in the futures market will honor their obligations. **No counterparty risk!**

The clearing house serves this role by adopting the position of buyer to every seller and seller to every buyer.

Every trader in the futures market has obligations only to the clearing house.

The clearing house takes no active position in the market, but interposes itself between all parties to every transaction.

So as far as the farmers are concerned, they can sell their goods to the clearing house at the price of the futures contract when the contract expires.
Clearing Members

- For cash-settled futures, clearing members act as the counterparty.
Index Futures’ Fair Price

What’s the fair price of an index futures?

In index points

Fair price = cash price

+ costs incurred to hold the index’s stocks

– benefits from holding the index’s stocks

Essentially, futures seller holds the underlying asset on behalf of the futures buyer until maturity.

For index futures, the cost is mainly opportunity cost, i.e., interest earned from cash deposit in a bank

Benefit includes corporate distributions: dividends, stock dividend, specie in kind, rights etc
Final Settlement Price

- The final settlement price is the value of the MSCI Singapore Free Index (SIMSCI) computed based on the Special Quotation methodology applied on each component stock SIMSCI on the day following the last trading day.

- The Special Quotation is calculated by MSCI using the first traded price of each component stock, irrespective of when these stocks first trade on the SGX trading day.

- If any component stock is not traded by SGX market close on the day following the Last Trading Day, the last official closing price of that stock will be used to calculate the Special Quotation.
Motivation

- SIMSCI cash index is updated about every 15 seconds.
- It would be nice to calculate the futures fair price by knowing also how to compute the cash index level.
- After all, there are only about 28 stocks.
- The cash index is dominated by 5 stocks:
  - SingTel
  - DBS
  - OCBC
  - UOB
  - Keppel Corp
Pricing Forward Contract the Quant Way

- Seller creates a **self-financing** and **assured** cash flow.

Today 0
- Sell a futures contract with agreed price $F(0,T)$
- Borrow money at an interest rate $r_0$ for a sum of $S_0$ to buy the asset at the price of $S_0$

At maturity $T$
- Sell security to the buyer at the agreed price $F(0,T)$
- Pay back $S_0$ plus interest
Insight!

- The net cash flow at time 0 is zero.

- Since the cash flow at time $T$ is exactly determined today, there is no uncertainty, and thus no risk!

- If no risk, then no risk premium.

- The net cash flow at time $T$ has to be zero.
  - Of course, the seller is not foolish to agree with a $F(0,T)$ that is less than $(1+r_0 T) S_0$ and giving money away.
  - On the other hand, if $F(0,T) > (1+r_0 T) S_0$, the seller will gain without taking risk.
Insight!

✓ Law of one price (no arbitrage)
  ✓ Future net cash flow pre-determined or fixed in advance (today) must equal today’s net cash flow to annihilate arbitrage opportunities.

✓ Today
  ✓ \( S_0 - S_0 = 0_0 \)

✓ At time \( T \)
  ✓ \( F(0,T) - (1+r_0T) S_0 = 0_T \)

✓ The formula \( F(0,T)=(1+r_0T) S_0 \) is called the fair (forward) price.
Trading Application?

Knowing the fair price is important to have a feel of the market dynamics.

Market futures prices for SIMSCI is not usually the same as the fair price.

Strategy

- If $P(t, T) > F(t, T)$, sell the futures
- If $P(t, T) < F(t, T)$, buy the futures

Will this algo strategy work?

- Answer: NO!
Application: X Factor

- Futures market prices $P(t, T)$ does not always follow what the theory says about the fair price $F(t, T)$.
- Especially for relatively not so liquid futures such as SIMSCI futures, the market price tends to be traded at
  \[ P(t, T) = F(t, T) + X \]
- The X factor is usually \(-10\) ticks when related futures markets are “sentimentally soft.”
- Conversely, the X factor can be \(+10\) ticks when the markets are “sentimentally strong.”
- The X factor may be \(-20\) ticks for a period of time in the day when the markets are under stress.
Detailed Calculations of SIMSCI

Cash Index
SIMSCI Index Component Stocks as at end of December 13, 2013

The cash index value is 353.31. And the divisor value is 673,384,854.58
<table>
<thead>
<tr>
<th>Symbol</th>
<th>Name</th>
<th>Weight</th>
<th>Last Price</th>
<th>FX</th>
<th>Free-Float Shares</th>
<th>Market Cap</th>
</tr>
</thead>
<tbody>
<tr>
<td>QF206</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td><strong>MSCI SINGAPORE FREE</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td><strong>221,948,622,146.51</strong></td>
</tr>
<tr>
<td>D05</td>
<td>DBS GROUP HOLDINGS LTD</td>
<td>14.16%</td>
<td>17.740</td>
<td>1</td>
<td>1,772,036,854.70</td>
<td>31,435,933,802.38</td>
</tr>
<tr>
<td>Z74</td>
<td>SINGAPORE TELECOMMUNICATIONS</td>
<td>13.11%</td>
<td>3.650</td>
<td>1</td>
<td>7,971,788,474.50</td>
<td>29,097,027,931.93</td>
</tr>
<tr>
<td>O39</td>
<td>OVERSEA-CHINESE BANKING CORP</td>
<td>12.90%</td>
<td>9.100</td>
<td>1</td>
<td>3,145,297,022.25</td>
<td>28,622,202,902.48</td>
</tr>
<tr>
<td>U11</td>
<td>UNITED OVERSEAS BANK LTD</td>
<td>12.12%</td>
<td>20.770</td>
<td>1</td>
<td>1,295,656,081.60</td>
<td>26,910,776,814.83</td>
</tr>
<tr>
<td>BN4</td>
<td>KEPEL CORP LTD</td>
<td>3.89%</td>
<td>5.930</td>
<td>1</td>
<td>1,454,328,144.00</td>
<td>8,624,165,893.92</td>
</tr>
<tr>
<td>C31</td>
<td>CAPITALAND LTD</td>
<td>3.45%</td>
<td>2.990</td>
<td>1</td>
<td>2,564,630,247.60</td>
<td>7,668,244,440.32</td>
</tr>
<tr>
<td>F34</td>
<td>WILMAR INTERNATIONAL LTD</td>
<td>3.25%</td>
<td>3.750</td>
<td>1</td>
<td>1,921,020,331.80</td>
<td>7,203,826,444.25</td>
</tr>
<tr>
<td>MC0</td>
<td>GLOBAL LOGISTIC PROPERTIES LTD</td>
<td>2.69%</td>
<td>2.240</td>
<td>1</td>
<td>2,664,400,872.10</td>
<td>5,968,257,953.50</td>
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<tr>
<td>S68</td>
<td>SINGAPORE EXCHANGE LTD</td>
<td>2.61%</td>
<td>7.220</td>
<td>1</td>
<td>803,731,800.00</td>
<td>5,802,943,596.00</td>
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<tr>
<td>T39</td>
<td>SINGAPORE PRESS HOLDINGS LTD</td>
<td>2.57%</td>
<td>3.560</td>
<td>1</td>
<td>1,600,649,121.00</td>
<td>5,698,310,870.76</td>
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<tr>
<td>G13</td>
<td>GENTING SINGAPORE PLC</td>
<td>2.52%</td>
<td>0.925</td>
<td>1</td>
<td>6,047,013,412.00</td>
<td>5,593,487,406.10</td>
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<tr>
<td>C52</td>
<td>COMFORTDELGRO CORP LTD</td>
<td>2.49%</td>
<td>2.560</td>
<td>1</td>
<td>2,156,193,663.00</td>
<td>5,519,855,777.28</td>
</tr>
<tr>
<td>A17U</td>
<td>ASCENDAS REAL ESTATE INV TRT</td>
<td>2.45%</td>
<td>2.270</td>
<td>1</td>
<td>2,393,890,129.65</td>
<td>5,434,130,594.31</td>
</tr>
<tr>
<td>C6L</td>
<td>SINGAPORE AIRLINES LTD</td>
<td>2.39%</td>
<td>9.810</td>
<td>1</td>
<td>539,932,958.10</td>
<td>5,296,742,318.96</td>
</tr>
<tr>
<td>S63</td>
<td>SINGAPORE TECH ENGINEERING</td>
<td>2.31%</td>
<td>3.290</td>
<td>1</td>
<td>1,561,247,598.50</td>
<td>5,136,504,599.07</td>
</tr>
<tr>
<td>C38U</td>
<td>CAPITALAND MALL TRUST</td>
<td>2.11%</td>
<td>1.890</td>
<td>1</td>
<td>2,479,884,250.20</td>
<td>4,686,981,232.88</td>
</tr>
<tr>
<td>C07</td>
<td>JARDINE CYCLE &amp; CARRIAGE LTD</td>
<td>1.80%</td>
<td>40.370</td>
<td>1</td>
<td>98,809,072.25</td>
<td>3,988,922,246.73</td>
</tr>
<tr>
<td>T82U</td>
<td>SUNTEC REIT</td>
<td>1.79%</td>
<td>1.650</td>
<td>1</td>
<td>2,406,674,292.00</td>
<td>3,971,012,581.80</td>
</tr>
<tr>
<td>C09</td>
<td>CITY DEVELOPMENTS LTD</td>
<td>1.52%</td>
<td>8.250</td>
<td>1</td>
<td>409,185,450.00</td>
<td>3,375,779,962.50</td>
</tr>
<tr>
<td>NS8U</td>
<td>HUTCHISON PORT HOLDINGS TR-U</td>
<td>1.51%</td>
<td>0.445</td>
<td>1.4445</td>
<td>5,226,660,613.20</td>
<td>3,597,710,508.82</td>
</tr>
<tr>
<td>S58</td>
<td>SATS LTD</td>
<td>1.49%</td>
<td>4.890</td>
<td>1</td>
<td>674,433,765.00</td>
<td>3,297,981,110.85</td>
</tr>
<tr>
<td>C61U</td>
<td>CAPITALAND COMMERCIAL TRUST</td>
<td>1.39%</td>
<td>1.490</td>
<td>1</td>
<td>2,070,164,195.40</td>
<td>3,084,544,651.15</td>
</tr>
<tr>
<td>E5H</td>
<td>GOLDEN AGRI-RESOURCES LTD</td>
<td>1.38%</td>
<td>0.435</td>
<td>1</td>
<td>7,060,651,705.80</td>
<td>3,071,383,492.02</td>
</tr>
<tr>
<td>U14</td>
<td>UOL GROUP LTD</td>
<td>1.32%</td>
<td>6.080</td>
<td>1</td>
<td>483,587,761.80</td>
<td>2,940,213,591.74</td>
</tr>
<tr>
<td>U96</td>
<td>SEMBCORP INDUSTRIES LTD</td>
<td>1.30%</td>
<td>2.940</td>
<td>1</td>
<td>983,151,252.60</td>
<td>2,890,464,682.64</td>
</tr>
<tr>
<td>CC3</td>
<td>STARHUB LTD</td>
<td>0.77%</td>
<td>2.830</td>
<td>1</td>
<td>606,078,005.05</td>
<td>1,715,200,754.29</td>
</tr>
<tr>
<td>BS6</td>
<td>YANGZIJJIANG SHIPBUILDING</td>
<td>0.70%</td>
<td>0.810</td>
<td>1</td>
<td>1,918,538,500.00</td>
<td>1,554,016,185.00</td>
</tr>
</tbody>
</table>
Free Float

Number of shares that are available to the public. This figure is calculated by subtracting the shares held by insiders and those deemed to be stagnant shareholders from the shares outstanding.

Stagnant holders include
- Employee Stock Ownership Plans
- Employee Share Ownership Trusts
- Qualifying Employee Share Ownership Trusts
- Employee Benefit Trusts
- Corporations not actively managing money
- Venture capital companies
- Governments
Divisor

• MSCI Singapore Index is a free-float market cap weighted index.
• To convert the market cap into index points, a divisor is needed.
• Also, the interest and dividends in dollars are to be divided to compute the fair futures price.

What is the intuitive meaning of divisor?
Where and How to Find the Divisor

MSCI official web site
https://app2.msci.com/eqb/custom_indexes/sg_performance.html

Step by Step demo and hands-on practice
- Compute the market capitalization of each stock in Singapore dollars.
- Aggregate the market capitalizations of all stocks.
- Divide the aggregate market capitalization by SIMSCI index value.

The divisor remains unchanged unless there are changes to the component stocks or review of free floats, etc.
Example

- As at 28 Sep 2013, the total market cap of MSCI Singapore index’s 30 component stocks is S$246,760,012,464.
- The divisor is 673,384,854.58.
- The MSCI Singapore index value is therefore

\[
\frac{246,760,012,464}{673,384,854.58} = 366.45
\]
From Cash Index to Futures’ Fair Price
Interest Rate and Dividends

Having calculated the cash index from its component stocks, the next two things to do are

(1) Obtain an interest rate
(2) Check for dividends

Use SIBOR to compute the interest amount. Check out [https://abs.org.sg/rates-sibor](https://abs.org.sg/rates-sibor)

Interest Amount in Index Points

Interest Amount =

\[ \text{Cash Index} \times \left( \frac{\text{SIBOR in Percent}}{100} \right) \times \left( \frac{\text{Days to Maturity}}{365} \right) \]

Example

\[ 366.45 \times \left( \frac{0.3167\%}{100} \right) \times \left( \frac{31}{365} \right) = 0.10 \text{ index points} \]
Dividend Forecasts

- It is practical to concentrate on a few stocks that influence the index most.
- Forecast whether a company will pay dividends based on past dividend.
- Example:

<table>
<thead>
<tr>
<th>Company Name</th>
<th>Type</th>
<th>Ex-Date</th>
<th>Record Date</th>
<th>Date Paid/Payable</th>
<th>Particulars</th>
</tr>
</thead>
<tbody>
<tr>
<td>SINGTEL</td>
<td>DIVIDEND</td>
<td>19-Dec-16</td>
<td>21-Dec-16</td>
<td>11-Jan-17</td>
<td>SGD 0.068 ONE-TIER TAX</td>
</tr>
<tr>
<td>SINGTEL</td>
<td>DIVIDEND</td>
<td>02-Aug-16</td>
<td>04-Aug-16</td>
<td>17-Aug-16</td>
<td>SGD 0.107 ONE-TIER TAX</td>
</tr>
<tr>
<td>SINGTEL</td>
<td>DIVIDEND</td>
<td>21-Dec-15</td>
<td>23-Dec-15</td>
<td>13-Jan-16</td>
<td>SGD 0.068 ONE-TIER TAX</td>
</tr>
<tr>
<td>SINGTEL</td>
<td>DIVIDEND</td>
<td>30-Jul-15</td>
<td>03-Aug-15</td>
<td>19-Aug-15</td>
<td>SGD 0.107 ONE-TIER TAX</td>
</tr>
</tbody>
</table>

- Likely, Singtel will pay 10.7 cents per share in Aug 2017.
Then the dividend payable in dollars is

\[ D = \text{Free float shares} \times \text{dividend per share} \]

Also the interest from the ex-date to the expiration on the dividend must be paid, i.e.,

\[ D \times \text{days} \times r_0 / 365 \]

In total, adjustment for dividend is

\[ D \times (1 + \text{days} \times r_0 / 365) \]
Example

- A dividend of 4 cents per share is declared for a component stock.
- The free float is 857,313,920 shares.
- Suppose the ex-date of a dividend is 10 days before the near month expiration and 40 days before the far month expiration.
- Suppose the 1-month SIBOR is 0.30% per annum and the 2-month SIBOR is 0.35% per annum.
- The divisor is 673,384,854.58.
Dividends in Index Points for Near Month

- The dollar amount is obtained by
  \[ 0.04 \times 857,313,920 = 34,292,556.80 \]

- The total amount is
  \[ 34,292,556.80 \times (1 + 10 \times 0.003/365) = 34,295,375.37 \]

- To obtain the total dividend in index points, divide by the divisor:
  \[ 34,295,375.37 / 673,384,854.58 = 0.05 \text{ index points} \]
Putting Everything Together

- **Earlier**, we have computed that the interest amount in index points is 0.10.
- The fair price of the **front month** is,
  
  \[
  \text{Fair price} = \text{cash price} + \text{costs incurred to hold the index's stocks} - \text{benefits from holding the index's stocks} \\
  = 366.45 + 0.10 - 0.05 \\
  = 366.40.
  \]
Class Activity

- Use the latest information from https://app2.msci.com/eqb/custom_indexes/sg_performance.html to compute the divisor, the fair price of the front month SIMSCI futures.

- Compute the fair price of the spread between near- and far-month futures.
Time of the Day Effects: Abrupt Movements

- 8:30 a.m.: SIMSCI index futures call auction to open
- 8:58 a.m.: Cash market call auction
- 9:00 a.m.: Cash market starts continuous trading
- 5:00 p.m.: Cash market stops continuous trading
- 5:05 p.m.: Cash market call auction
- From 5:05 p.m.: to 5:10 p.m., SIMSCI futures price fluctuates because traders want to close their positions.
  - Some traders want to take profits
  - Some traders want to cover losses
- 5:15 p.m.: SIMSCI index futures call auction to close
Useful Tips for Trading SIMSCI Index Futures

- Before the cash market open, between 8:45 a.m. to 8:58 a.m., SIMSCI index futures tends to follow the Taiwan MSCI index futures.

- At 8:58 and 9 a.m., there may be abrupt futures price movements.

- At 9:15 a.m., HSI index futures opens in Hong Kong, and SIMSCI index futures starts to follow HSI index futures.

- At 3:00 p.m. (2:00 p.m. DST), DAX index futures opens

- At 4:00 p.m. (3:00 p.m. DST), DAX cash market opens

- At 4:15 p.m., after the HSI index futures closes, SIMSCI futures may be influenced by DAX index.