

# THE KLSE COMPOSITE INDEX FUTURES CONTRACT

## Media Article 4

The following article is the fourth part of a series of five educational articles presented by Malaysia Derivatives Exchange Bhd (MDEX). This series of articles provides a detailed explanation of the mechanics and trading applications of the KLSE Composite Index Futures. The publication of these articles is part of an on-going effort by MDEX to increase public awareness and knowledge of the financial instruments traded in the MDEX Market. Further information on educational programmes organised by MDEX may be obtained from the Strategic Planning & Product Development Department.

The titles of the series of articles are as follows:

- Article 1: The Structure of the Malaysian Financial Derivatives Industry
- Article 2: Stock Indices and Stock Index Futures Contracts
- Article 3: Basics of Stock Index Futures Trading
- Article 4: Pricing of Stock Index Futures
- Article 5: Hedging Applications of Stock Index Futures

## ARTICLE 4 : PRICING OF STOCK INDEX FUTURES

The futures price quoted in the market depends on the interaction of demand and supply. However, futures prices will not deviate very much from the theoretical price of the futures. The theoretical price of the futures is defined as the theoretical relationship of the futures contract with the underlying instrument. We will look at how the theoretical price of the futures is determined in a later section. Let us first briefly understand how arbitrage activities ensure that the futures prices stay in line with the theoretical prices.

### FUTURES ARBITRAGE

If the futures are trading well above or below the theoretical value, a cash/futures arbitrage may be possible.

For example, if the index futures price is higher than the theoretical value, a trader can make a riskless profit by simultaneously buying the component stocks that make up the underlying index in the cash market and selling futures contracts given the futures price is overstated. These activities would move the underlying index value higher and the futures prices lower. Since futures arbitrage provides a riskless profit opportunity, the arbitrageurs will continue to sell futures and buy underlying securities until the spread between the actual and theoretical price narrows and the arbitrage opportunity disappears.

Similarly, if the futures price is lower than the theoretical value, a riskless profit can be made by simultaneously selling the component stocks that make up the underlying index and buying futures contracts.

Usually, this sort of risk-free opportunity appears only for a very short period of time as the arbitrageurs will actively continue to arbitrage the difference between actual futures prices and theoretical futures prices. Their trading activities thus helps to ensure that the futures prices and the cash prices remain highly co-related fundamentally as expected.

## **BASIS**

Before we look into the theoretical value of the futures contract, let us understand the theory of the Basis. The basis is the net cost of carrying the futures contract to the maturity date. It reflects the difference between the spot price of the underlying instrument and price of the futures contract. For commodity futures contracts, the basis would take into account cost items like insurance and warehousing of the commodity over the period of time to maturity. For financial futures, the financing cost for the margin requirement is the primary component of the basis, and equity based futures will have to factor in the dividends receivable by an owner of physical stocks.

Basis can be illustrated from the simple mathematical formula as :

$$\mathbf{B = F - S}$$

where B = Basis

F = Future Price

S = Spot Price

If F is greater than S, then the basis is positive, and we can say that the futures contract is traded at a premium. On the other hand, where S is greater than F, then the basis is negative, and the futures contract is traded at a discount.

## **Basis Convergence**

In an efficient market, as the maturity date of the futures contract approaches, the futures price would converge to the spot price of the underlying cash index. This is known as basis convergence because the difference between the spot price and the futures price narrows with the passage of time. If the futures price does not converge to the spot price, the futures price will be out-of-line with the theoretical price of the futures and a clear arbitrage opportunity would arise.

## **THEORETICAL VALUE OF THE FUTURES**

Theoretical values of futures contracts can be calculated by an investor looking at whether to buy futures or the underlying basket of stocks. An investor buying the shares would have to pay for them now but would receive benefits such as dividends. The futures investor would not need to pay for the shares now, and therefore, he can place the investment money into the fixed income products and earn interest. However, he foregoes the dividends that may be received by buying the shares. Hence, the futures price needs to reflect the interest that can be earned and the dividends that are foregone. As explained earlier, the difference between the futures price and the price of the underlying basket of shares is referred to as the net cost of carrying i.e. the basis.

The formula for calculating the theoretical value of the futures is as follow:

$$FP_{t,T} = CP_{t,T} + \left[ CP_{t,T} \times (R_{t,T} - D_{t,T}) \times \left( \frac{T-t}{365} \right) \right]$$

Where :

FP<sub>t,T</sub> = Stock index futures price at time t of a contract with settlement date T

C<sub>p,t</sub> = Price of the cash index at time t

R<sub>t,T</sub> = Annualised financing rate for period T-t

D<sub>t,T</sub> = Expected average dividend yield

The derivation of the above futures price for a stock or portfolio of stocks is based on the following assumptions:

**Assumptions:**

1. There are no taxes or transaction costs
2. There are no restrictions on short selling in the stock market
3. The borrowing and lending rates are equal and constant

Consider the following example:

Interest Rate = 6%  
 Index Level = 1000  
 Time to expire = 90 days  
 Dividend = 2%

Three month futures = 1000 + (1000 x (6% - 2%) x 90/365)  
 = 1000 + 9.86  
 = 1009.86

Since the tick size is 0.1 index point, the futures would be quoted as 1009.90. This is an approximation as the calculation uses the dividend yield on an annualised basis. In practice the actual dividend will be used since they are paid in discrete amounts.

In most cases the basis will be positive, with the futures trading above the index level as interest rates are usually higher than dividend yields. However, dividends tend to be concentrated during certain periods of the year when

companies usually announce final and interim results. During this time, the basis may well be negative. When this occurs, futures should theoretically trade at a discount to the index level.

At this juncture, we can summarise the advantages and associated problems of stock index futures trading as follows:

### **ADVANTAGES OF USING STOCK INDEX FUTURES**

Stock index futures provides investors and portfolio managers with an important new tool having a number of significant advantages:

- Stock index futures permits investment in the stock market without the trouble and expense involved in buying the shares themselves.
- Operating under a margining system like all other futures, stock index futures contracts allow full participation in market moves without significant commitment of capital. The margining system normally allows the leverage use of Funds between 7 and 14 times.
- Transaction costs are typically many times lower than those for share transactions. The fees for a "round trip", the creation and subsequent liquidation of a KLSE Composite Index Futures position is approximately RM120 (this includes the commission and clearing costs). The costs involved in buying or selling an equivalent value of shares are typically several thousand Ringgit.
- It is legal to take a short position in futures under FIA 1993. However, short selling is currently banned in stock market.
- Portfolio managers responsible for large share portfolios can hedge the value of their investment against bear moves without having to sell the shares themselves.

These advantages provide valuable new opportunities for investment managers and speculators alike.

### **PROBLEMS INVOLVING THE USE OF STOCK INDEX FUTURES**

#### **Constructing The Index Portfolio.**

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Most stock indices used as the basis for index futures comprise several hundred separate shares. This complexity creates numerous difficulties in constructing a share portfolio designed to mimic the index.

### **Tracking Error.**

In practice, many market makers hedge stock index futures by using a smaller subset of the companies within the index. The aim is to capture a significant proportion of the composition of the index with relatively few transactions. While this can reduce transaction costs, it introduces a tracking error, in that the value of the share portfolio may not correlate perfectly with movements in the index.

### **Lag Between Index Price And Share Prices.**

In markets where share transactions are executed manually, it may be difficult or impossible to execute all the necessary transactions at the same time. If the market is moving while the cash-and-carry is being established, this may introduce a price risk. Even if it were possible to execute all the transactions simultaneously at one moment in time, the index price is normally based on the last sale price of the component shares, whereas the cost of buying the shares is based on the current offer price. In a fast-moving market, there could be a considerable gap between these two prices.

### **Changes In Index Composition.**

The index composition may change during the cash-and-carry period. This may arise from stock splits, capital restructuring, the shrinkage or disappearance of some companies, or the growth of others. If this happens, new transactions must be executed to bring the shares held, in line with the new formulation of the index. (This is somewhat analogous to the situation when the cheapest-to-deliver bond changes.)

### **Short Sales.**

Some stock markets impose certain restrictions on short sales of shares, and this could impair the efficiency of a reverse cash-and-carry operation, which involves selling shares and buying futures.

### **Dividends**

Dividends can only be estimated in advance and are paid at various times during the year. Even for broad-based indices like the S&P 500, there is a strong bunching of dividends in January-February, April-May, July-August and

in October-November. The effective carrying cost can therefore vary substantially throughout the year, especially before the payment of a large dividend on a narrow-based stock index. This means that hedging a stock index futures contract can at best only be an approximate, rather than an exact, science.

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In the next article, we will see how stock index futures can be used by portfolio managers such as unit trust funds to manage their market risks.