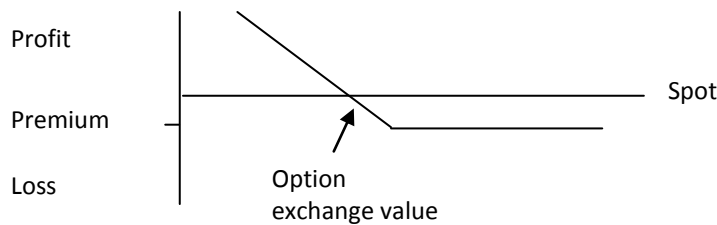


## Graphical Solutions to Futures Contracts

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Analysis of futures contracts remains a central part of most advanced courses of study in financial management. Whilst the mathematics behind these contracts is relatively straightforward students seem to find the concept problematic. In part this is due to the way it is usually presented as an algorithm to be worked through rather than a temporal snapshot. The use of graphical methods may both enhance students understanding and provide an alternative method of calculation. Graphical illustrations are traditional used with options contracts, though students generally find these conceptually less taxing. Whilst the original source of these charts is now lost in time they are familiar to readers of financial management texts.

Figure 1: Put Option



When calculating the value of a futures contract at point  $t$ , its margin, the gain or its efficiency we usually use some form of the following (simplified) process:

**1. Select month closest to required date**

**2. Calculate number of contracts required:**

$$\frac{\text{Investment amount}}{\text{Contract size}}$$

**3. Calculate basis:**

$$\text{Spot price} - \text{futures price} = \text{basis}$$

**4. Calculate out basis at date contract is closed out:**

$$\text{Basis} * \frac{\text{Months left}}{\text{Total futures months}}$$

**5. Determine expected price of future at point  $t$**

$$\text{Spot} - \text{Basis at } t = \text{Futures Price}$$

Margin is then the difference between this and original price

**6. Determine futures gain (loss)**

$$\text{Margin} * \text{contracts} * \text{contract size}$$

**7. Calculate efficiency of hedge**

$$\frac{\text{Profit on futures contract}}{\text{Investment amount}}$$

Loss on spot

Whilst students are usually able to follow this process with positive results it is also apparent that an understanding of what is happening and why is sometimes missing. What is required, perhaps, is the portrayal of the problem in a more visual way. The following question is solved using a traditional approach and represented graphically.

Question:

Assume today is June 30<sup>th</sup>. An amount of money is owed by an American company trading in dollars to a Japanese company trading in Yen. The money (¥100m) is due on the 1<sup>st</sup> of September. Current spot price is \$/¥128.10 (\$0.007806).

Future Contracts exist per ¥12,500,000 settled on 30th.

Sept. 0.007884 premium (¥126.84)

Dec. 0.008334 premium (¥199.99)

Spot price on September 1<sup>st</sup> is ¥120

**1. Select month closest to required date**

September

**2. Calculate number of contracts required:**

$$\frac{¥100m}{¥12.5m} = 8$$

$$\frac{¥100m}{¥12.5m}$$

**3. Calculate basis:**

$$¥128.10 - ¥126.84 = ¥1.26$$

**4. Calculate out basis at date contract is closed out:**

$$¥1.26 * \frac{1}{3} = ¥0.42$$

**5. Determine expected price of future at point t**

$$¥120 - ¥0.42 = ¥119.58 (\$0.008363)$$

$$\text{Margin is then } \$0.008363 - \$0.007884 = \$0.0004786$$

**6. Determine futures gain (loss)**

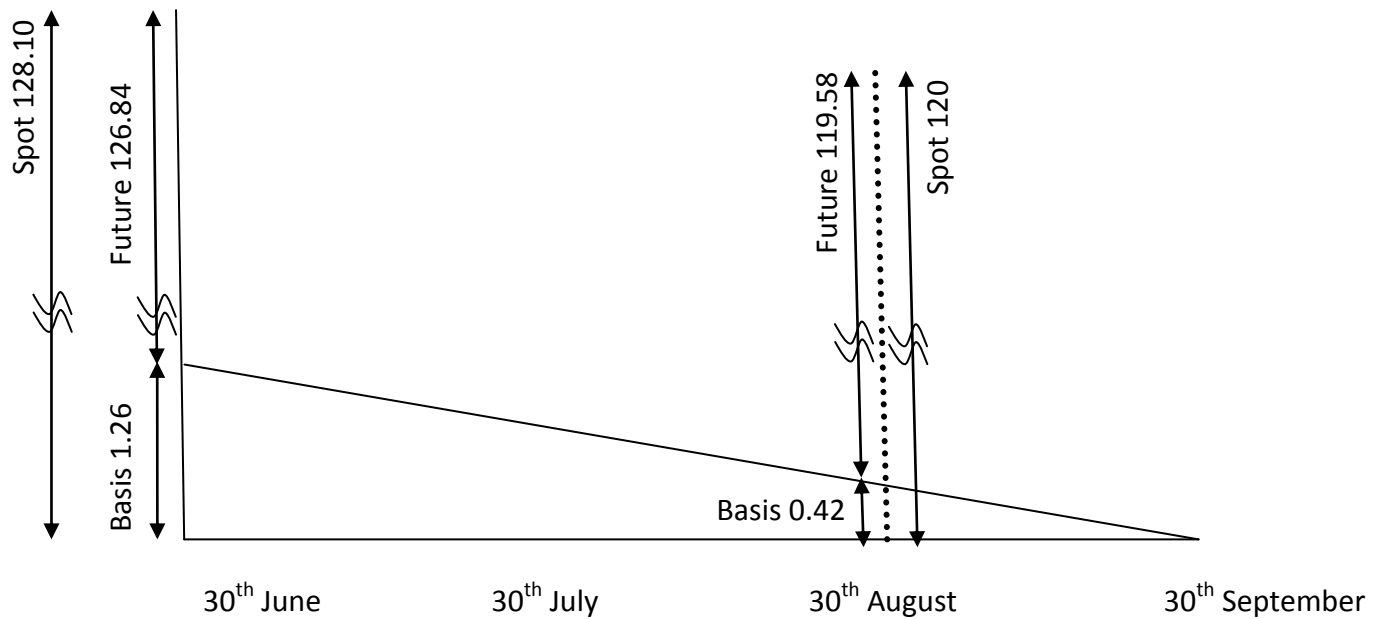
$$\$0.0004786 * 8 * 12,500,000 = \$47,860$$

**7. Calculate efficiency of hedge**

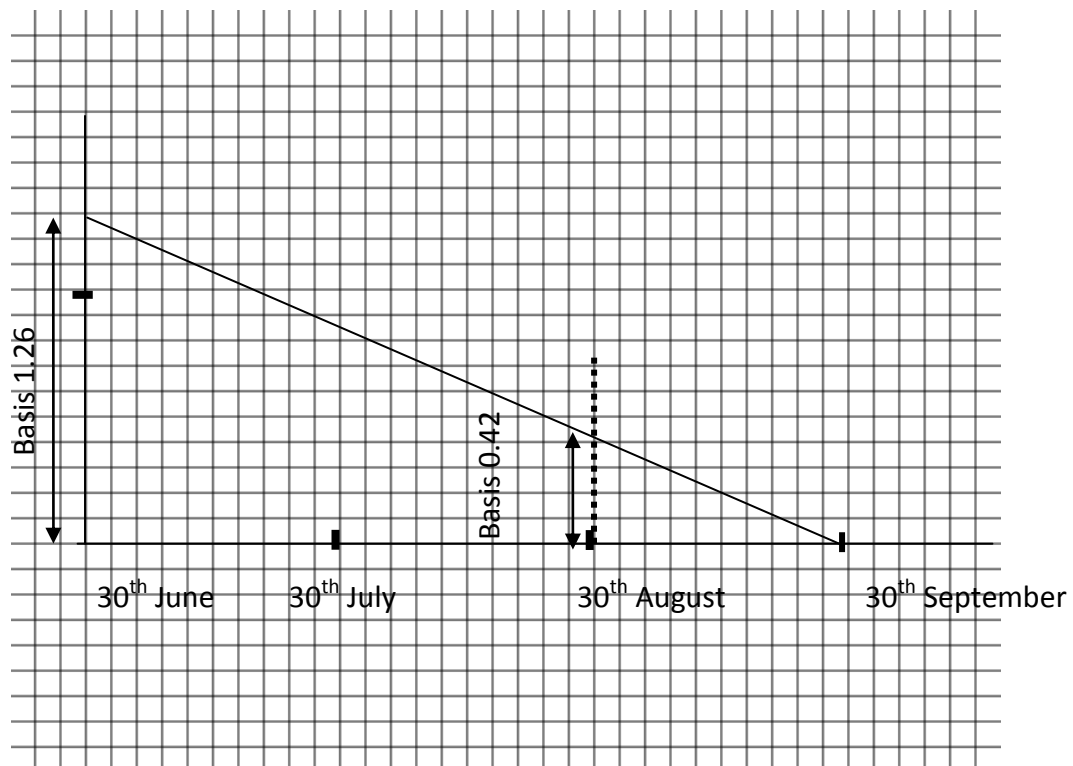
$$\frac{\$47,860}{(¥200m / ¥120) - (¥200m / ¥128.10)} = 45.4\%$$

Whilst this process methodically gets us to the desired result it favours student who is able to learn by rote a system. The same problem can be represented with a simple diagram that captures both the decay in value over time. In addition it

simplifies the problem to one students will be familiar with from studies of depreciation of assets.



In addition to this overall representation it is possible to use charts to solve part of the calculation. If the determination of basis value at point  $t$  is considered then the construction of a chart on graph paper will produce a value that can be read from a suitable scale.



It is hoped that graphical representation will enable visual students to understand the concept of futures concepts more rapidly promoting more effective and efficient learning. Although this does not represent an alternative to existing calculations the approach may bring comfort to struggling students.