

Elton, Gruber, Brown, and Goetzmann
***Modern Portfolio Theory and Investment Analysis*, 7th Edition**
Solutions to Text Problems: Chapter 24

Chapter 24: Problem 1

The no-arbitrage condition for stock-index futures appears in the text as:

$$\frac{F}{(1+R)} = P - PV(D)$$

Given that $F = \$200$, $P = \$190$, $R = 6\%$, and $PV(D) = \$4$, we have:

$$\frac{\$200}{1.06} = \$188.68 > \$190 - \$4 = \$186$$

so the futures are overpriced relative to the underlying index.

Therefore, the arbitrage would involve selling the futures, borrowing the present value of the futures price and the present value of the dividends at 6% for six months, using some of the borrowed funds to buy the index today ($t = 0$), and keeping the remainder as arbitrage profit. Six months from now ($t = 1$), receive the futures price for the index, receive the future value of the dividends, and use the proceeds to pay off the loan. The cash flows are as follows:

	<u>t = 0</u>	<u>t = 1</u>
sell futures	0	\$200
borrow $\$200/(1.06)$ plus \$4 at 6% for six months	$\$188.68 + \4 $= \$192.68$	$-\$192.68(1.06)$ $= -\$204.24$
buy index for delivery against futures contract in six months	-\$190	0
receive six months of dividends and invest them at 6%	0	$\$4(1.06) = \4.24
total cash flow	\$2.68	0

So the arbitrage profit is \$2.68 per futures contract. If the present value (at $t = 0$) of transactions costs is \$2.68 or greater then the arbitrage opportunity is negated.

Chapter 24: Problem 2

Yes. Farmers need to be assured that they can sell their crops at harvest time, regardless of market conditions, so that they can make planting and farm equipment decisions in advance of the harvest. Even if both farmers and General Mills believe that the spot price at the expiration of the futures contract will be higher than the futures contract price (so that the farmers would get more money selling their crops later on at the spot price than by selling futures), futures contracts make sense economically to the farmers, since selling futures now eliminates the uncertainty of selling their crops later.

General Mills needs to ensure a steady supply of wheat for their products regardless of market conditions, and knowing the price of wheat in advance helps in making pricing and working capital decisions. So a futures contract makes economic sense from their point of view as well, even if they share the same distributional assumptions as the farmers that spot wheat prices will be lower at the expiration of the futures contract than the futures contract price, since buying futures now eliminates the uncertainty of the cost and availability of wheat later.

Chapter 24: Problem 3

One equation for interest rate parity that appears in the text is:

$$R^D = \frac{F}{S}(1 + R^F) - 1$$

where R^D is the domestic interest rate, R^F is the foreign interest rate, F is the domestic futures price for one unit of foreign currency, and S is the spot exchange rate expressed as domestic currency per unit foreign currency; i.e., both F and S are expressed in direct terms. From a U.S. viewpoint, the quotes given in the problem are in indirect terms, so, if R^D is the U.S. rate and R^F is the rate for Japan, then, from the problem, $F = 1/115$ and $S = 1/120$. So solving the above equation for the U.S. rate gives:

$$\begin{aligned} R^D &= \frac{1}{\frac{115}{1}} \times (1.04) - 1 \\ &= \frac{120}{115} \times (1.04) - 1 \\ &= 0.0852 \text{ (8.52\%)} \end{aligned}$$

Chapter 24: Problem 4

Assume you match the durations (interest rate sensitivities) of long-term and short-term bond futures by holding them long or short in the necessary proportion. Assuming a normal yield curve, you believe that long-term rates will fall relative to short-term rates. If the market does not share your belief today, and if long-term rates fall and short-term rates rise, then the prices of long-term bonds and long-term bond futures will rise and the prices of short-term bonds and short-term bond futures will fall. Therefore, you want to be long in long-term bond futures and short in short-term bond futures. If instead the entire yield curve shifted up, short-term rates would have to rise more than long-term rates for the spread to narrow, so the above position would still be profitable. If the entire yield curve shifted down, long-term rates would have to fall more than short-term rates for the spread to narrow, so the above position would still be profitable.

Chapter 24: Problem 5

Assuming that a futures market exists for corporate bonds, sell futures contracts to deliver \$100 million of 19-year corporates one year from today. In one year, close out your futures position by delivering your 19-year corporate bonds; from your viewpoint today, your 20-year corporates have thus been shortened to 1-year corporates.

A strategy that uses futures that are in fact traded would require selling futures today on 20-year government bonds. In one year, sell your corporate bonds and use the proceeds to purchase an offsetting futures contract on 19-year government bonds to close out your futures position. The additional risk with this strategy is basis risk, which is the risk that the prices of government bonds and government bond futures will not move in exactly the same way as corporate bonds of the same maturity.

Chapter 24: Problem 6

To lock in today's rates, sell \$40 million of 10-year government bond futures. If interest rates rise, the value of the futures will fall, which means a profit for you since you are short the futures. At the end of three months, when your own bond issue is floated, close out your futures position by buying an offsetting futures contract. If interest rates have in fact risen, use the profits from your futures position to finance the increased interest payments on your bond issue. If interest rates have fallen, use some of the proceeds from your bond issue to cover your loss from your futures position. Either way, ignoring basis risk, the effective interest rate on your bond issue is locked in at today's rates by selling futures.