Introductory Cases on Accounting for Derivative Instruments and Hedging Activities

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Preface

This set of cases and explanatory material covers the main concepts in Statement of Financial Accounting Standards No. 133, *Accounting for Derivative Instruments and Hedging Activities* (SFAS 133). It is addressed to accountants and financial analysts who are not financial instruments experts, but who desire to learn at least the basics of the economic underpinnings of, and the accounting for, this increasingly important sphere of economic activity. The basic materials include (1) a brief summary of most of the principle requirements of SFAS 133; (2) a primer on the economics of derivatives, their use as economic hedges, and journal entries illustrating the new accounting treatments; and (3) five cases, each with several alternative scenarios, that provide the opportunity to apply the concepts presented in the summary of SFAS 133 and the primer. Also available are four spreadsheet templates that can be used to determine numerical values for use in the journal entries; printouts of these spreadsheets are also included with the corresponding cases so the cases can be completed without access to a computer. Finally, Powerpoint[1] slides are provided for use during discussions of the cases. The slides cover important points to stress during presentation of each case, as well as some solution journal entries.

The cases illustrate accounting for the four main types of derivatives (swaps, forwards, futures, and options). They also illustrate three out of the four accounting treatments allowed for derivatives under SFAS 133, depending on hedging relationship: no hedging relationship, a fair value hedge, or a cash flow hedge. Not illustrated is the accounting for a hedge of a net investment in a foreign operation. The cases also illustrate the four market risk categories most frequently hedged using derivative instruments (interest rate, foreign exchange rate, commodity price, and equity price risks).

Throughout development of the cases, an attempt was made to identify and develop simple, yet plausible, business situations where hedging activity would make economic sense. In this way, students will not only be introduced to the basic economics of and accounting for derivatives and hedging activities, but will also get an introduction to business situations where hedging is a valuable activity.

The following summaries of the five cases highlight the topics illustrated in each one. Additional points that might be made when presenting the cases are also suggested.

1. "J. Adams and Company: Accounting for Interest Rate Swaps in a Horizontal Yield Curve Environment" illustrates all three accounting treatments for derivatives and related hedged items. It should be covered by all users of these cases, as the three types of accounting are illustrated using a single instrument. This allows students to focus on differences in accounting treatments, holding other factors (types of derivatives, pricing mechanisms, and underlying transactions) constant. It requires a minimum of discussion of pricing issues, requiring only that students understand how fair values of fixed-rate bonds, and cash flows related to variable-rate investments, change as interest rates change.

   Students are asked to prepare journal entries and summary financial statements for three years for four different scenarios. First, to provide a benchmark for comparisons of hedging results, journal entries and statements are required for fixed-rate debt and a variable-rate investment, assuming no interest rate swap is used as a hedge.

[1] Powerpoint is a registered trademark of Microsoft.

Second, three sets of journal entries and statements are prepared, assuming the same basic financial instruments as well as an interest rate swap. For the first set, the interest rate swap is not designated as a hedge. For the second and third sets, the swap is designated as a fair value hedge, then a cash flow hedge. Based on the three years of incomes under the four different alternatives, students are asked to calculate the standard deviations of net income, other comprehensive income, and accumulated other comprehensive income.[2] Comparisons of these standard deviations will highlight the effects of the different accounting treatments on resulting accounting reports.

This case was specifically "engineered" to show the effects of an interest rate swap used to hedge a mismatch between the interest characteristics of interest-bearing assets and liabilities. Therefore, the net income series has variability when no interest rate swap is used (the benchmark situation), and no variability if the interest rate swap is designated as either a fair value or a cash flow hedge. Companies may also use interest rate swaps to effectively turn variable-rate assets (or debt) into fixed-rate assets (or debt), even though they have no existing fixed-rate debt (or assets). In these cases, the interest rate swap designated as a cash flow hedge will also reduce variability in net income, while increasing volatility in other comprehensive income. However, companies may also use interest rate swaps to effectively turn fixed-rate debt (or assets) into variable-rate debt (or assets), even if they have no existing variable-rate assets (or debt). In these cases, the *unhedged* net income series will have no variability (due to the fixed-rate debt or assets), while the hedged series will have variability.

In these latter situations, when the interest rate swap is being used to change the interest rate characteristics of a single interest-bearing instrument (or portfolio of similar instruments), the shortcut method suggested by the FASB may provide a more intuitive understanding of how the company is using the interest rate swap. An extension of the case into one or both of these other situations may provide insight.

2. "Gannonsan Micro-Brewery: Accounting for Forwards Hedging Foreign Currency Transactions" illustrates fair value and cash flow hedges, and introduces the concept of *ineffectiveness*. In the basic case, a foreign exchange forward to purchase Hong Kong dollars with yen is used as a fair value hedge by a Japanese company to hedge a firm commitment denominated in Hong Kong dollars. Three alternative scenarios then extend the case. The first alternative alters the assumption of a firm commitment to an assumption of an anticipated transaction. Therefore, the same forward, with the same changes in fair values, is now designated as a cash flow hedge. Students are able to see the difference in accounting treatments without having to repeat the valuation exercise. In both of these scenarios, there is no ineffectiveness in the hedging relationship.

   The second and third alternatives incorporate ineffectiveness. In these scenarios, the firm commitment (second alternative) or anticipated transaction (third alternative) is denominated in Hong Kong dollars, while the foreign exchange forward is for the purchase of U.S. dollars. Since the Hong Kong dollar is pegged within a range of the

[2] The case specifies calculation of population standard deviations, rather than sample standard deviations. If sample standard deviations are calculated, the qualitative relationships among the numbers summarizing variability under the different accounting treatments will not change, although the actual numbers will not match those provided in the solutions.

U.S. dollar, the forward will be highly effective in hedging the purchase transaction. However, there will be some ineffectiveness, as there is some variation in the exchange rate between the U.S. dollar and the Hong Kong dollar. Again, students do not have to recalculate the effects of variation in the yen-Hong Kong dollar exchange rate—the calculations done for the basic scenario carry over to the last two alternatives. Calculation of the effects of the change in yen-U.S. dollar exchange rates has to be done only once as well; results are used in alternative two for accounting for a fair value hedge of a firm commitment, then in alternative three for a cash flow hedge of an anticipated transaction.

Students may have difficulty viewing yen as the functional currency, and Hong Kong dollars and U.S. dollars as the foreign currencies. Originally, this case was cast as a U.S. company hedging Dutch guilder purchases, first with Dutch guilder forwards, then with German deutschemark forwards. However, recognizing that exchange rate variability between the German deutschemark and the Dutch guilder will cease January 1, 1999, with the introduction of the Euro, finding a non-European alternative was desirable. The stability of the Hong Kong dollar-U.S. dollar exchange rates suggested their use as the closely-related foreign currencies, and another Asian country as the home of the company undertaking the hedging activity. Although students may have difficulty thinking of yen as the functional currency, it should nevertheless be a useful exercise, given the increasing internationalization of business.

3. "Pimentel Cigar Company: Accounting for Options Hedging Equity Securities" illustrates a third fair value hedge using stock options, introduces more sophisticated derivatives pricing models (the Black-Scholes options pricing model), illustrates derivative price changes due to more than one factor (changes in underlying and passage of time), and introduces the concept of excluding part of the change in value of the derivative from assessment of hedge effectiveness. Purchased put options are used to hedge an investment in available for sale equity securities. Effectiveness is determined based on changes in the *intrinsic* value of the options. Changes in option values due to passage of time are excluded from determination of hedging effectiveness, and are included in net income during the period of the change. The effectiveness of hedging with options with different strike prices is illustrated in the second part of the case. An Excel[3] spreadsheet for determining option values and changes in values is available from the authors (send email to `teets@jepson.gonzaga.edu` for details).

4. "C.L. Smith and Sons: Accounting for Futures Hedging Commodity Purchases and Sales" illustrates the accounting for futures designated as cash flow hedges of anticipated transactions, the purchase of soybeans and the sale of soybean oil and soybean meal by a soybean processing company. The case comes in two versions, "regular" and "lite." The "regular" version extends the treatment of accounting for cash flow hedges in several ways. First, futures on three different commodities (soybeans, soybean oil, and soybean meal) are used simultaneously. Second, futures relating to three different delivery months for each of the three commodities are used as hedges. Having a number of different hedges in effect at the same time significantly increases the difficulty of the case over the previous cases, but brings the case closer to the situation faced by companies who hedge extensively using futures (one company reports its hedging activities result in 60,000 futures transactions per year—close to 300

[3]Excel is a trademark of Microsoft.

transactions per business day). Third, the company specifies that hedge effectiveness will be assessed based on changes in fair value attributable to changes in spot prices. Therefore, changes in fair value due to changes in the difference between futures and spot prices will be recognized in net income during the period of change.

In the main scenario, the portion of the change in fair value of the futures due to changes in spot prices is completely effective in offsetting the discounted change in expected cash flows related to the anticipated transactions (purchases and sales of soybeans, soybean oil, and soybean meal), because the processing plant is assumed to be located in Toledo, Ohio, at one of the delivery points specified in the futures contracts. Therefore, the futures prices and related spot prices are for exactly the same commodities as the commodities actually purchased and sold. The alternative scenario in the "regular" version alters this assumption, locating the processing plant in Atlanta. SFAS 133 does not allow the assumption that commodities in different locations have the same prices. Therefore, companies cannot assume the portion of the change in value of a futures contract due to changes in spot prices at the futures delivery point will perfectly offset the change in discounted expected cash flows based on spot prices in a different location. Ineffectiveness must be identified, and reflected in net income, along with the portion of the change in fair value of the future excluded from determination of hedge effectiveness. Only the effective portion of the change in the fair value of the future may be reflected in other comprehensive income.

The "lite" version of the case is the same as the "regular" version, except that hedging of only one month's purchases and sales is considered, rather than three. This reduces the computational difficulty considerably, at the expense of less appreciation of the complexity encountered by companies engaged in extensive hedging activities.

5. "J. Adams and Company Revisited: Accounting for Interest Rate Swaps in an Upward-Sloping Yield Curve Environment" is not primarily an accounting extension, but rather an illustration of pricing complexities. The opening interest rate swap case is amended slightly, by introducing an upward-sloping yield curve. This requires calculation of implied forward rates from the yield curve, the use of implied forward rates to calculate expected cash flows, and the use of different discount rates to discount expected cash flows occurring at different times. Certain accounting complications arise due to the upward-sloping yield curve underlying the interest rate swap. Rounding out the set of cases, this case again illustrates the accounting for a single derivative used as a speculative instrument, a fair value hedge, and finally as a cash flow hedge.

In presentations of these cases, the authors have found it useful to start discussion of the solution to each case by asking five questions: (1) What is the entity's risk management objective and strategy in entering into the hedge? (2) What is the hedging derivative? (3) What is the hedged item (or items)? (4) What is the specific risk being hedged? and (5) How will hedge effectiveness be evaluated? Asking these questions in each case accomplishes two objectives. First, it emphasizes that the company must define all five of these items before hedge accounting may be used. Second, it provides a brief reminder of most of the pertinent facts of each case, and prepares the way for discussion of the journal entries implementing the requirements of the new accounting standard.

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Summary of Accounting for Derivative Instruments and Hedging Activities

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Summary[4] of Accounting for Derivative Instruments
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One part of accounting for derivatives is very simple conceptually: balance sheets show as assets and/or liabilities the fair values of all derivative instruments. For a simple interest rate swap, the fair value is often simply the sum of the present values of expected cash flows, discounted using an appropriate interest rate.[5]

It is in accounting for *changes* in derivatives' values that different accounting treatments are possible. In two situations, a change in the fair value of a derivative is recognized in net income during the period of the change. The first is when the derivative is not accounted for as a hedge. This may occur because the derivative was entered into only because of its profit potential, or it does not meet the criteria to be accounted for as a hedge. The second situation where a change in the fair value of a derivative is recognized in net income during the period of the change is when the derivative is designated[6] as a hedge of the exposure to changes in fair value attributable to a specific risk of a recognized asset, liability, or unrecognized firm commitment. Consider fixed-rate long-term debt from the issuer's point of view. As market interest rates fall, the fixed cash payment stream is discounted at a lower interest rate. The fair value of fixed-rate debt, a liability, increases. A decrease in market rates leads to a change in the value of a receive-fixed, pay-variable interest rate swap that at least partially offsets the increase in the fair value of the fixed-rate debt liability. The change in fair value of the swap occurs for two reasons. First, lower interest rates decrease the cash outflow related to the pay-variable leg of the swap, but there is no change in the cash inflow associated with the receive-fixed leg. Overall, there is a decrease in net cash outflow, or an increase in net cash inflow. Second, the fair value of the swap changes because the net cash flows are discounted at a lower interest rate. The receive-fixed, pay-variable interest rate swap *hedges* the fair value of the debt because, and to the extent that, the change in the fair value of the swap is effective in offsetting the change in the fair value of the debt.[7,8] In order to appropriately reflect the hedging relationship, the change in fair value of the hedged item attributable to the hedged risk is shown as a loss or gain in net income, offsetting, at least partially, the gain or loss on the derivative, also shown in net

[4]This is a brief summary of a very complex standard. It does not cover treatment of embedded derivatives, nor does it attempt to discuss how effectiveness is assessed. The interested reader is referred to Statement of Financial Accounting Standards No. 133, "Accounting for Derivative Instruments and Hedging Activities," (SFAS 133) for full explanation.

[5]In an interest rate swap, the *notional* amount is not exchanged, but is used to calculate interest payments and receipts. Generally, only one net amount is exchanged at each settlement date.

[6]To designate a derivative as a fair-value hedge, management must formally document at inception of the hedge "the hedging relationship and the entity's risk management objective and strategy for undertaking the hedge, including identification of the hedging instrument, the hedged item, the nature of the risk being hedged, and how the hedging instrument's effectiveness in offsetting the exposure to changes in the hedged item's fair value attributable to the hedged risk will be assessed. There must be a reasonable basis for how the entity plans to assess the hedging instrument's effectiveness." (SFAS 133, paragraph 20.a.) Similar language requires management to identify and document the relation between a derivative designated as a cash flow hedge and the exposure to variability in cash flows of the hedged item attributable to a specific risk.

[7]Exactly offsetting changes in value will occur infrequently in practice. However, Statement 133 outlines in paragraphs 68–70 conditions sufficient for companies to assume no ineffectiveness in the hedging relationship. The interested reader is referred to the Statement.

[8]A more detailed explanation of why the interest rate swap changes in value as interest rates change is provided in the accompanying material entitled "A Primer on the Economics of Hedging Using Derivatives."

income. If there is no ineffectiveness in the hedging relationship, the overall effect on net income is zero. The change in fair value of the hedged item that is attributable to the hedged risk is also reflected by a change to the recorded amount of the hedged item on the balance sheet.

In two other hedging situations, a change in the value of a derivative is recognized in *other comprehensive income* in the period of change, and is reclassified into net income when the hedged item affects net income. In the first of these situations, the derivative is designated as hedging the exposure to variability in cash flows of a forecasted transaction or financial instrument with variable rate terms, attributable to a particular risk. Consider a variable-rate instrument from the investor's standpoint. The fair value of the investment generally remains constant as market interest rates change, because the rate on the investment resets periodically to the market rate. Therefore, there is no risk to the investor from changes in fair value. However, there is risk due to potential variation in cash flows. The variability of cash inflows can be hedged with a receive-fixed, pay-variable interest rate swap. In this case, changes in fair values of the derivative are shown as they occur as gains/losses in other comprehensive income (OCI), which is closed each period to Accumulated OCI (AOCI), a component of shareholders' equity (SHE).[9] When the *hedged* cash flow affects net income, the amount of the gain/loss on the hedging derivative in AOCI is recognized in net income. In order to avoid double-counting the derivative's gain/loss in comprehensive income (and SHE), a "reclassification adjustment" *reduces (increases)* OCI by the amount of the gain (loss) on the hedging derivative now reflected in net income.[10] The second situation where a change in the value of a derivative is recognized in other comprehensive income during the period of the change occurs when the derivative is designated as a hedge of the foreign currency exposure of a net investment in a foreign operation. Accounting for this situation is beyond the scope of this summary.

Effectiveness

The preceding material assumes the hedging instrument is fully effective in offsetting changes in value or cash flows of the hedged item due to a particular risk. In practice, this will not always be the case. For example, a purchased put option hedging against declines in the value of available-for-sale equity securities will increase in value as the stock's price declines. But the value of the option will also be affected by the passage of time, even if the stock's price remains constant. As another example, a company may choose to hedge one foreign currency with derivatives in a different foreign currency that generally moves with the first, but that trades in a more liquid market (e.g., cross currency hedges). Even if the currencies generally move together, it is unlikely that they will move exactly together. The

[9]The terms "other comprehensive income" and "accumulated other comprehensive income" are explained in Statement of Financial Accounting Standards No. 130, "Reporting Comprehensive Income." Comprehensive income, defined in Concepts Statement No. 6, is "the change in equity [net assets] of a business enterprise during a period from transactions and other events and circumstances from nonowner sources. It includes all changes in equity during a period except those resulting from investments by owners and distributions to owners" (SFAC 6, paragraph 70). It comprises net income and "other comprehensive income" (OCI). OCI is used "to refer to revenues, expenses, gains, and losses that under generally accepted accounting principles are included in comprehensive income but excluded from net income" (SFAS 130, paragraph 10). OCI for a period is added to OCI from prior periods and presented as "accumulated other comprehensive income," a component of equity shown separately from retained earnings and additional paid-in capital in the statement of financial position.

[10]See Statement of Financial Accounting Standards No. 130, "Reporting Comprehensive Income," especially Appendix C, paragraphs 132–9, for a full treatment of this topic.

standard does not allow a derivative to be designated as a hedging instrument unless it is expected to be *highly effective* in achieving offsetting changes in fair values or cash flows relative to the changes experienced by the hedged item. A company may define, within certain parameters, how the effectiveness of the hedging relationship will be judged. In certain instances, a portion of the change in the fair value of a derivative may be excluded from determination of effectiveness; this excluded portion will always be recognized in net income during the period of the change. The portion used to determine effectiveness may not always be completely effective in achieving offsetting changes; any ineffectiveness in this portion will also be recognized in net income during the period of the change. This presents a lesser difficulty in a fair value hedge, as changes in the value of the hedging derivative are already recognized as gains or losses in net income. However, for cash flow hedges, the change in value of the derivative must be separated into, potentially, three portions: the portion excluded from determination of effectiveness, and the effective and ineffective parts of the portion used to determine effectiveness. Only the effective part is recognized in OCI, while the ineffective part and the portion excluded from determination of effectiveness are recognized in net income.[11]

Discontinuation of a hedging relation

Hedge accounting is no longer permitted if (a) the company dedesignates the hedging relation; (b) the hedging relation no longer meets the effectiveness criterion; (c) the derivative instrument matures or is sold, terminated, or exercised; or (d) the forecasted transaction being hedged is no longer expected to occur. In general, if (a), (b), or (c) is the reason for discontinuation, there are no catch-up adjustments necessary. If the derivative still exists, it will still be marked to fair value at each balance sheet date, but hedge accounting would cease and gains and/or losses will be recognized in net income. If a fair value hedge is discontinued, the previously-hedged item is not marked to fair value for subsequent changes in value, but entries recording previous changes in value are not reversed. If a cash flow hedge is discontinued, but the occurrence of the forecasted transaction is still reasonably possible, the amount accumulated in AOCI remains there, until the forecasted transaction affects earnings. If it is probable that the forecasted transaction will not occur, the amount accumulated in AOCI is immediately recognized in net income.

[11] Effectiveness must be evaluated period by period, and on a cumulative basis. There can be situations in which the sum of the effective parts, determined period by period, are less than the cumulative effectiveness. In that case, a reclassification adjustment between net income and other comprehensive income may be necessary. The interested reader is referred to the Standard, particularly Example 6, paragraphs 140–143.

A Primer on the Economics of Hedging Using Derivatives

Walter R. Teets Robert Uhl

A Primer on the Economics of Hedging Using Derivatives

Walter R. Teets and Robert Uhl

The purpose of hedging activities is to insulate a business from changes in market prices or rates over which management has little or no control. Management makes plans based on expectations of what prices will be. If there are significant differences between the expected prices when plans were made, and the actual prices when the plans are implemented, actual results may be far different from expectations. Hedging activities essentially allow management to protect against price changes by either locking in the current price, or locking in today the price expected at some future date. Derivative financial instruments are particularly useful in hedging against a number of price risks.

The purpose of hedge accounting is to address anomalies in the income statement caused by recognizing linked items on different bases (e.g., recognizing hedged items at cost and associated hedging derivatives at fair value). There are a few general concepts that apply to accounting for any type of hedging activity. These will be discussed before examining specific price risks and hedging instruments. The first general concept is that, since hedging activities are undertaken to protect a business from risk of price changes that would affect existing assets or liabilities, or planned transactions, it is necessary to consider the effect of price changes on both the hedging instrument and the hedged item. Hedges work because a price change affects the hedging instrument in the opposite manner from the way it affects the hedged item, resulting in offsetting changes. Therefore, if a price change occurs, one needs either to recognize the effect of a price change on the hedging instrument and the hedged item, or to defer recognition of the effect of the price change on both the hedging instrument and the hedged item. Reflecting the effect of a price change on only half of the overall position may be misleading.

The second general concept is that the better the hedging instrument is matched to the hedged item, the more effective it will be at achieving offsetting changes in values or cash flows when price changes occur. If a company plans to purchase 7,000 bushels of corn on August 10, a derivative instrument indexed to the purchase of 7,000 bushels of corn for delivery on August 10 will be effective, whereas an instrument indexed to the purchase of 10,000 bushels of wheat on September 1 generally will not be effective. To the extent that the terms of the hedging instrument do not match the terms of the hedged transaction, there will be ineffectiveness of the hedge. Ineffectiveness should be reflected in the income statement by whatever accounting method is used.

Third, both changes in prices and passage of time affect the values of both the hedged item and the hedging instrument. In general, hedges are designed specifically to hedge changes in price. In many cases, the passage of time affects the hedged item and the hedging instrument similarly, and need not be considered separately. However, particularly for options, the passage of time may affect the hedging instrument's value differently from the way it affects the value of the hedged item. When there is a difference, one must decide how to reflect this difference.

Finally, there are relationships between expected future prices, also called forward prices, and current prices, also called spot or cash prices. The most important one is that expected future prices and spot prices converge as a given future date draws closer. On February 1, there may be a large difference between the spot price of a bushel of wheat today, and the expected future price of a bushel of wheat on July 1. There should be less of a difference

between the spot price on June 25 and the future price on July 1. This implies that one can use hedges based on future prices to hedge the effects of changes in spot prices. However, there will probably be ineffectiveness in the hedging relationship that should be reflected in the accounting treatment of the hedging derivative and hedged item.

There are four major categories of prices that may create risk exposures for an entity, and that management generally has no control over: interest rates, foreign exchange rates, prices of other companies' stocks, and prices of commodities. There are also four principle types of derivatives in common use for hedging these exposures: swaps, forwards, futures, and options.[12] The remainder of this section presents brief introductions to the economics of and accounting for each of these four types of derivatives. The cases that follow this introductory material provide opportunities to increase understanding through application of the concepts. In the introductory material and the cases, interest rate swaps are used to hedge interest rate risk, forwards are used to hedge foreign exchange rate risk, futures are used to hedge commodity price risk, and options are used to hedge equity price risk. However, each of the four types of derivatives may be used to hedge any of the four risk categories. Specifics of the contracts will differ, but concepts remain the same.

Swaps: This introduction to swaps covers only interest rate swaps, although there can be other types of swaps. Interest rate swaps are agreements between two parties to exchange payments that are calculated using different interest rates. Two common types of interest rate swaps are (1) receive-fixed, pay-variable (or, from the point of view of the other party to the swap, receive-variable, pay-fixed) and (2) basis swaps, receive-variable based on one rate, 3-month LIBOR[13] for example, pay-variable based on another rate, 3-month commercial paper for example. We will examine the first type, a receive-fixed, pay-variable swap.

A plain interest rate swap contract defines several items. First, it identifies the *notional* amount of the swap, the amount of money that will be used in calculating the interest rate payments to be exchanged. It is similar to the principal of a bond, except that the notional value is not exchanged; it is simply used as a reference amount. The swap contract also identifies the fixed interest rate that will be used to calculate the fixed interest payments to be received by one of the swap participants, and the variable interest rate that will be used to calculate the variable interest payments made by that same participant. Any of a number of variable rates may be used to determine a swap's variable rate. Examples include LIBOR, 3-month treasury, and 3-month commercial paper. Finally, the plain interest rate swap contract identifies the payment frequency of the fixed and variable legs of the swap, and the dates on which the variable rate resets to the current variable rate. For example, a swap contract entered into on January 1 might indicate that the fixed-rate receiver was to receive payments based on a fixed 8% annual interest rate, and was to make payments based on 3-month LIBOR, 6% on January 1. The interest payments were to be calculated on a $1,000,000 notional amount, were to be paid quarterly on January 1, April 1, July 1, and September 1, and were to be made for 3 years. Finally, the contract would define when the variable rate used to calculate the variable interest rate payments was to be reset to current market rates. Typically, reset dates correspond to payment dates. In this example, the first interest payment would occur April 1. Conceptually, the fixed interest receipt

[12] Some would say there are only two main types of derivatives, forwards and options. Economically, swaps are simply a sequence of forwards, and futures are simply exchange-traded forwards.

[13] London InterBank Offered Rate

would be calculated as $8\% \times \$1,000,000 \times \frac{3}{12} = \$20,000$. The variable payment would be $6\% \times \$1,000,000 \times \frac{3}{12} = \$15,000$. Generally, only the net amount is exchanged, so on April 1, the fixed-rate receiver would receive $5,000. On April 1, the variable rate would reset to the current LIBOR rate; assume it is now 6.4%. Therefore, on July 1, the fixed-rate receiver would receive net interest of $4,000 ($[8\% \times \$1,000,000 \times \frac{3}{12}] - [6.4\% \times \$1,000,000 \times \frac{3}{12}]$). The value of the interest rate swap at any point in time is the net present value of the expected net cash payments/receipts, discounted at market rates. The value of a swap changes with changes in three (sets of) variables: expected net cash flows, the discount rate used to present-value the cash flows, and time remaining in the swap contract. Both the expected net cash flows and the discount rate are related to interest rates, so changes in interest rates will cause changes in value of the swap. Note that the value of the swap changes because one price, the fixed interest rate, does not change over the life of the swap, while another price, the variable interest rate, does change. The value of the swap is determined by the relative levels of these two prices.

The mechanics of swap valuation depend on current expectations of interest rates. The simplest case, almost never seen, is that of a horizontal yield curve environment. In this environment, expectations of interest rates for all future time periods are equal to today's interest rate; current conditions are expected to continue. If the current LIBOR variable rate is 6%, the variable rate expected for all future periods is also 6%. If the 6% rate leads to a net receipt by the fixed-rate receiver of $5,000, and the swap has two years remaining, the value of the swap is simply that of an eight period annuity of $5,000 per period, discounted at an appropriate rate. Therefore, in this example, assuming a horizontal yield curve, the value of the swap is the present value of an annuity of $5,000 for 8 periods, discounted at 6% annual rate, or 1.5% per period.[14]

An interest rate swap is a useful tool for hedging risks associated with changing interest rates. For example, a company with fixed-rate debt of $1,000,000 paying 8% annual interest rate faces the risk of changes in the fair value of the debt associated with changes in market interest rates. As market rates decrease, the market value of the debt increases. (However, under GAAP, companies do not record changes in the value of their own debt except in a few very limited circumstances.) All other things being equal, therefore, the market value of the company decreases as the fair value of the liability increases. A receive-fixed, pay-variable interest rate swap, however, can hedge the fair value of the debt. As market rates decrease, the fixed receipt on the swap remains constant, while the variable payment decreases. Therefore, net cash flows on the swap are positive; decreases in market rates which lead to a decrease in the company's value (due to an increase in the fair value of a liability) also lead to an offsetting increase in the fair value of the swap.

The same swap also can be used to hedge against the risk of changing cash flows associated with variable rate investments. Assume a company has an investment in bonds earning interest at LIBOR. As interest rates change, the company will receive varying amounts of

[14]The first interest rate swap case in this set assumes a horizontal yield curve. In a sloping yield curve environment, the concepts remain the same, although the details become more complicated. A sloping yield curve environment implies that expectations of future interest rates are not equal to today's rate. Those expected future rates are used to form expectations about future cash flows. Then expected cash flows occurring at different points in time are discounted at appropriate rates. For example, a cash flow occurring one-year in the future is discounted using the current one-year interest rate, while a cash-flow occurring two years in the future is discounted using the current two-year interest rate. The interest rate swap extension assumes an upward sloping yield curve environment.

interest. The receive-fixed, pay-variable interest rate swap hedges the varying cash flows associated with the investment. As interest rates on the investment decrease, leading to lower cash inflows, the variable rate on the swap also decreases, leading to higher cash inflows on the swap. These higher cash inflows on the swap offset the lower cash inflows on the investment.

The challenge for accounting is to reflect the economics of hedging while providing periodic reports whose issuance does not necessarily cover the entire life of the hedge. If a hedge is entered into and ended within an accounting period, all offsetting cash flows will have occurred, and no accounting difficulties are encountered. However, if a hedging relationship spans several accounting periods, offsetting cash flows under even a perfectly effective economic hedge may occur in different accounting periods, leading, under the historical cost model of accounting, to accounting income numbers that do not capture the hedging relationship. The "Summary of Accounting for Derivative Instruments and Hedging Activities" briefly describes the accounting now available to better depict the results of hedging activities. Presented below are several simple illustrations of the new accounting. The cases "J. Adams and Company: Accounting for Interest Rate Swaps in a Horizontal Yield Curve Environment" and "J. Adams and Company Revisited: Accounting for Interest Rate Swaps in an Upward-Sloping Yield Curve Environment" provide two opportunities to apply that accounting.

Illustration 1: Assume a company has $100 of fixed rate debt with a coupon of 5%, with annual payments occurring each December 31. Assume also that the company enters into a receive-5%-fixed-rate, pay-LIBOR-variable-rate interest rate swap, with annual payments, and a notional amount of $100. For simplicity of presentation, assume that the company faces a horizontal yield curve environment; LIBOR at inception of the swap is 5%. Assume that the debt and the swap both mature in five years. The swap qualifies as, and is designated as, a hedge against changes in the fair value of the debt due to interest rate changes. Assume the swap was entered into at no cost, as is typically the case.

Accounting entries, end of year 1

The year-end journal entries for this swap and the hedged fixed-rate debt are as follows. First, the cash interest payment on the debt is recorded as usual.

Interest Expense	WW	
Cash		WW

Net cash payments are made on interest rate swaps. Therefore, there will be no payment on the swap at the end of the first year, since the receive-fixed interest rate and the pay-variable interest rate at the start of the year were both 5%. Now assume that, at the end of the year, interest rates decrease and that the fair value of the swap as an asset and the fair value of the debt both increase. Statement 133 requires that the fair values of derivatives be shown on the balance sheet. For derivatives designated as fair value hedges, changes in value are reflected in net income. An adjusting entry is needed at the end of each accounting period to record the change in value of the interest rate swap.

Swap Receivable	XX	
Gain on Swap		XX

Under Statement 133, the change in the fair value of the hedged item attributable to the hedged risk is also reflected in the financial statements, with the following entry.

Loss on Long-term Debt	XX	
Long-term Debt		XX

If the changes in fair values of both items perfectly offset, the effect on net income is zero. In addition, the recorded amount of the fixed-rate debt has been adjusted. Prior to Statement 133, a company's own debt was not adjusted to reflect changes in market interest rates. (Statement 133 does not change accounting for a company's own debt unless it qualifies as, and is designated as, a hedged item.) Subsequent changes in values of the swap and debt will be accounted for similarly.

Accounting entries, end of year 2

In addition to the entries at the end of the first and subsequent accounting periods recording changes in the values of the swap and debt, several other changes in accounting are required in subsequent periods. First, the interest expense calculation (journal entry not shown) on the debt will use an adjusted effective rate, frequently the discount rate used to discount the swap and the debt, rather than the nominal rate on the debt or the effective interest rate determined at time of issuance of the debt.[15] Second, the swap receivable recorded in the adjusting entry at the end of the first year is an interest-bearing asset. Interest will be accrued on it, based on the recorded swap balance and the discount rate used to fair value the swap.

Swap Receivable	YY	
Interest Revenue		YY

The decrease in interest rates at the end of the first year (which is the beginning of the second year) means the interest rate used to calculate the interest payment on the variable leg of the swap is lower than the interest rate used to calculate the receipt on the fixed leg of the swap. Therefore, at the end of the second year, the company receives cash on the swap. The cash received on the swap will reduce the swap asset, rather than being considered interest revenue.

Cash	ZZ	
Swap Receivable		ZZ

Finally, as at the end of the first year, changes in the fair value of the interest rate swap and the fixed-rate debt must be recorded (journal entries omitted).

Illustration 2: Consider the same swap, but now assume the company has a $100 variable rate investment, earning LIBOR. Assume the swap qualifies as, and is designated as, a hedge against variability in cash flows on the variable rate investment due to interest rate changes.

Accounting entries, end of year 1

At the end of the first year, the company records the receipt of interest on the variable rate investment as usual.[16]

[15] Statement 133 provides a shortcut method that achieves the same result and may prove useful in practice; however, for understanding the economics underlying the new accounting, using the approach illustrated here should be more beneficial.

[16] If interest payment dates do not line up with ends of accounting periods, interest accrual entries and cash receipts may occur at different times. For simplicity of exposition, this example assumes annual interest payments occurring at the end of annual accounting periods.

Cash	WW	
Interest Revenue		WW

Again, assume interest rates decrease, resulting in an increase in the value of the swap as an asset. The fair value of the derivative must be shown on the balance sheet. However, changes in fair values of derivatives designated as cash flow hedges do not affect net income immediately. Instead, changes are reflected in Other Comprehensive Income (OCI). When the hedged cash flow affects net income, a reclassification adjustment reverses the related amount previously reflected in OCI, and recognizes it in net income. To record changes in the fair value of the swap at the end of the first and subsequent accounting periods, the following entry is made.

Swap Receivable	XX	
OCI		XX

Note that the fair value of the investment has not changed, as it is a variable rate investment whose fair value is not affected by interest rate changes.

Accounting entries, end of year 2

As in the case of the fair value hedge, interest should be accrued in subsequent periods, based on the recorded swap balance and the discount rate used to fair value the swap. However, the interest accrued will be reflected in OCI, rather than in net income, with the following entry.

Swap Receivable	YY	
OCI		YY

Cash received on the swap will decrease the swap receivable, as it did in the fair value hedge illustration (journal entry omitted).

At the end of the second year, as at the end of the first, interest revenue will be recognized on the variable rate investment, at the variable rate set at the end of the first year (beginning of the second year). This cash flow is one of the hedged anticipated transactions, and is reflected in net income with the usual entry:

Cash	ZZ	
Interest Revenue		ZZ

Since a hedged cash flow has now occurred, and is reflected in net income through the preceding entry, a reclassification adjustment is needed for the offsetting *portion* of the change in the hedging derivative previously reflected in OCI. (The change in the value of the swap recorded in OCI at the end of the first year related partly to this cash flow, and partly to future expected cash flows.) The following entry reflects the necessary reclassification adjustment.

Reclassification Adjustment (OCI)	WW	
Interest Revenue		WW

Finally, as at the end of the first year, changes in the fair value of the interest rate swap must be recorded (journal entry omitted).

Forwards: A forward is a contract between two parties to enter into an exchange at a specified future point in time, at prices agreed upon at the inception of the forward. For

example, a Japanese company that generally does business in yen may need Hong Kong dollars for a transaction at a fixed point in the future. The Japanese company may enter into an agreement to receive a given number of Hong Kong dollars (HK$) in the future, to be paid for with a set number of yen (¥), agreed upon at the start of the agreement. Even if the exchange rate between Japanese yen and Hong Kong dollars has changed by the future date, the Japanese company will pay the yen and receive the Hong Kong dollars agreed upon in the contract. Assume the Japanese company and a bank agreed to exchange ¥15,000 for HK$1,000 at some specified point in the future. If at that future date, the market price of HK$1,000 is ¥16,000, the transaction will still take place at the agreed-upon price. The Japanese company has received ¥16,000 worth of HK$ for ¥15,000, and has realized a gain of ¥1,000. Immediately before the exchange, the forward contract has a value to the Japanese company of ¥1,000. This value is due to a change in the ¥ value of HK$, while the forward rate is fixed. Alternatively, at the time of the exchange, HK$1,000 might have a market value of ¥14,000. In this case, the Japanese company would receive ¥14,000 worth of HK$ for ¥15,000, suffering a loss of ¥1,000. Immediately before the exchange, the forward contract has a value of −¥1,000 to the Japanese company. Again, the value of the forward is due to a change in the market price of HK$ in terms of ¥, while the price specified in the forward contract is fixed.

Continuing with this example, assume that on January 1, the Japanese company enters into the forward contract described above. The exchange of ¥15,000 for HK$1,000 is to take place on December 31. On January 1, if both parties agree that the market exchange rate on December 31 is likely to be ¥15:HK$1, there will be no cost to either party to enter into the forward contract. Now, advance the calendar to July 1. If on July 1, the exchange rate expected to be in effect on December 31 is ¥16:HK$1, what is the value of the forward contract? Again, the Japanese company anticipates a gain of ¥1,000, since it will have to pay only ¥15,000 for what would have to be purchased for ¥16,000 absent its forward contract. However, the cash flow will not occur for six months. Therefore, the forward contract has a value at July 1 of the present value of ¥1,000.

If we now assume that the reason the Japanese company needed HK$1,000 was to make an equipment purchase for which it had signed a contract on January 1 for HK$1,000, we can see that the forward contract hedges the Japanese company against changes in the ¥:HK$ exchange rate. At the time the equipment contract was signed, the Japanese company committed to pay HK$1,000, regardless of the ¥:HK$ exchange rate. The Japanese company may want to fix the yen cost of the transaction, rather than the HK$ cost. By entering into the forward contract to exchange ¥15,000 for HK$1,000, the Japanese company has fixed the effective cost of the equipment at ¥15,000. As the exchange rate changes to ¥16:HK$1 on July 1, the Japanese company faces a loss on the equipment contract of ¥1,000 (it will have to pay ¥16,000 for something it valued originally at only ¥15,000). But that loss is offset by the gain on the forward contract of ¥1,000 (it will purchase HK$ currently worth ¥16,000 for only ¥15,000). The forward contract hedges against changes in the value of the equipment contract attributable to changes in the ¥:HK$ exchange rate. The following journal entries will record the change in values of both the forward contract and the firm commitment (discounting has been omitted in this example).

Forward Contract	1,000	
Gain on Forward Contract		1,000
(Record the gain on the forward contract)		
Loss on Firm Commitment	1,000	
Firm Commitment		1,000
(Record the loss on the firm commitment)		

Both the gain on the forward contract and the loss on the firm commitment will be included in net income, for a net effect of zero. Note that the firm commitment is included as a liability on the balance sheet. If the firm commitment were not designated as the hedged item, it would not be shown as a liability on the balance sheet (unless it met the requirements for loss recognition and liability accrual by analogy to ARB 43). Assuming no change in the exchange rate during the rest of the contract period, the entry for the purchase of the equipment for HK$1,000, yen value ¥16,000, would also include closing the firm commitment liability.

Equipment	15,000	
Firm Commitment	1,000	
Cash		16,000

Alternatively, if no contract has been signed for the equipment purchase, the equipment purchase presents a risk of cash flow variability. The extra ¥1,000 resulting from the purchase of ¥16,000 worth of HK$ for ¥15,000 under the forward contract offsets the increased cash required to purchase the equipment. Thus, a forward contract can also be used to hedge the risk of variability of cash flows. In this case, the only entry needed would be the entry to record the derivative at fair value, with the gain credited to OCI (again ignoring discounting).

Forward Contract	1,000	
OCI		1,000

Assuming the equipment is purchased, it will be recorded at ¥16,000. The gain on the forward contract recorded in OCI will be reclassified into net income as depreciation on the equipment affects net income.

The accounting for situations in which forward contracts are used as hedging instruments is illustrated in the second case, "Gannonsan Micro-Brewery: Accounting for Forwards Hedging Foreign Currency Transactions."

Futures: Economically, futures are simply exchange-traded forwards. There are some important differences, however. The two parties to a *forward* may negotiate all terms of the forward, including quantities to be exchanged, and where and when the exchange is to take place. Therefore, the contract terms of the forward can be set to match the important terms of the hedged item. In contrast, *futures* are standardized—quantities, delivery points, and delivery times, as well as a number of other elements, are set by an exchange such as the Chicago Board of Trade.[17] For example, soybean futures are for 5,000 bushels of a certain grade of soybean. Delivery of soybeans under a soybean futures contract can be made only at Chicago, Toledo, and a few other locations, and only during the month(s) specified in

[17]Exchange-traded futures also have margin account requirements. For this introduction to the economics of and accounting for futures, coverage of margin accounts is not essential.

the contracts. (However, most futures are settled at their fair values in advance of the time delivery would be required. Physical delivery rarely occurs.) The inconvenience of not being able to tailor a contract to a company's exact needs is offset by the ease of access and the liquidity and counterparty credit protection provided by a centralized exchange. The only relevant element of the contract that is not set by the exchange is the futures price. That is set by market forces, and changes throughout the trading day. Once a futures contract is entered into, however, the futures price is set for that contract. A change in value of the future is caused by the same principle factor that causes the value of a forward to change: the expected market price of soybeans, in the case of a soybeans future, is different from the price locked in at the inception of the future. If a company bought a soybean future, and the expected price of soybeans increases, the company has an asset, as it can buy soybeans below the current market price. On the other hand, if a company sold a soybean future, and soybean prices increase, the company has a liability—it has agreed to sell soybeans below the expected market price. Again, most contracts are closed out before physical delivery would be required. But the amount at which a company can close out a position is determined by the difference between the expected market price and the price in the futures contract, discounted to present value.

In the earlier material on forwards, hedging was described based entirely on the forward price, the price agreed upon at inception of the forward for a transaction to occur at a future date. Since the forward can be tailored to match exactly the date of the transaction in the future, it makes sense to think of hedging based on the forward price. On the other hand, futures cannot be tailored to a specific transaction date. Therefore, changes in prices between contract inception and the exchange-specified futures maturity date may not exactly offset changes in prices to an intermediate date, or a more distant date. Assume a company desires to purchase 5,000 bushels of soybeans on June 15, and wants to hedge that purchase with a soybean futures contract. There is no soybean future for June 15. However, there are July soybean futures. The company can enter into a July soybean future, and designate it as a hedge of the exposure to variability in cash flows associated with the anticipated purchase of soybeans on June 15.

The company can choose to measure the variability of expected cash flows in terms of spot prices, that is, in terms of the change between the spot price of soybeans on the day the company entered into the futures contract, and the price of soybeans at each balance sheet date. However, the fair value of the futures contract is based on the difference between the future price specified in the futures contract and the expected future price at the balance sheet date. It is unlikely the future prices and the spot prices will move exactly together. Statement 133 allows a company to exclude from determination of effectiveness, and therefore from the hedging relationship, the change in fair value of a derivative due to changes in the difference between futures prices and spot prices. The relation between changes in futures prices and changes is spot prices is given in the following derivation, where F_0 is the expected future price locked in by entering into the futures contract and S_0 is spot price at time 0, when the company enters into the futures contract, and F_1 and S_1 are the future price and spot price at a balance sheet date in the future.

$$\begin{aligned} F_0 - F_1 &= (F_0 + S_0 - S_0) - (F_1 + S_1 - S_1) \\ &= [S_0 + (F_0 - S_0)] - [S_1 + (F_1 - S_1)] \end{aligned}$$

$$= \underbrace{(S_0 - S_1)}_{\substack{\text{Change in} \\ \text{Spot Prices}}} + \underbrace{[(F_0 - S_0) - (F_1 - S_1)]}_{\substack{\text{Change in difference} \\ \text{between future and spot price}}}$$

At each balance sheet date, the company can obtain the current futures and spot prices needed to value the futures contract and apportion that value between the portion due to changes in spot prices and the portion due to changes in the difference between futures prices and spot prices. The value of the futures contract(s) F_v at the balance sheet date is given by

$$F_v = ((F_0 - F_1) \times q) \times PVF_{n,i}$$

where F_0 and F_1 are as defined earlier, q is the quantity specified in the futures contract (times the number of contracts, if more than one contract was entered into), and $PVF_{n,i}$ is the appropriate present value factor needed to discount the expected future cash flow for n periods at interest rate i. Similarly,

$$S_v = ((S_0 - S_1) \times q) \times PVF_{n,i}$$

is the portion of the value of the futures contract(s) at the balance sheet date due to changes in spot prices. The portion due to changes in the difference between futures prices and spot prices is simply $F_v - S_v$.

If the company has chosen to measure variability in anticipated cash flows by changes in spot prices, the portion of the *change* in value of the futures due to changes in spot prices will exactly offset the change in expected cash flows due to a change in spot prices, discounted to present value. This portion of the change in value of the futures is therefore an effective hedge of the anticipated transaction, and is reflected in OCI. The *change* in the value of the futures contract due to the change in the difference between futures prices and spot prices will be excluded from determination of hedge effectiveness, and will be reflected in net income. The entire fair value of the futures contract will still be reflected as an asset or liability in the balance sheet. At the end of each accounting period, the following journal entry will be made to record the change in value of the futures contracts, and to apportion the change into OCI and net income. (The journal entries made at each balance sheet date will use the same accounts, but whether the entries to specific accounts are debits or credits will depend on the relative changes in futures and spot prices.)

Futures Contracts	XX	
OCI		YY
Other Income		ZZ

The accounting for situations in which futures contracts are used as hedging instruments is illustrated in the fourth case, "C.L. Smith and Sons: Accounting for Futures Hedging Commodity Purchases and Sales."

Options: Options differ in a fundamental way from swaps, forwards, and futures. In swaps, forwards, and futures, the parties to the contract commit to undertake a transaction at an agreed-upon date and price. Both parties are obligated to perform. With an option, the future transaction may or may not occur, at the choice of the purchaser of the option. For example, a company with an investment in stock may plan on selling the stock in the

future to finance construction of a building. It will want to protect itself against possible declines in the price of the stock, but would prefer to benefit from increases in price. If it enters into a forward at a certain price, it will be protected if the stock's price decreases, but will not benefit if it increases. Instead, it can purchase a put option. The put option allows the company to sell the stock to the writer (seller) of the option at an agreed-upon price. If the price of the stock when the company decides to sell is below the agreed-upon price, the company may compel the writer of the option to buy the stock at the agreed-upon price. However, if the price of the stock is above the agreed-upon price, the company can simply let the option expire unexercised, and sell the stock on the open market.

Since the purchaser of the option has no risk of loss, and the writer of the option has no possibility of gain on the indexed instrument, the writer of the option requires a payment when the option is entered into, to compensate for the risk of loss. This payment is called the option premium, and is equal to the fair value of the option at inception. Therefore, options, unlike most swaps, forwards, and futures, are shown on the balance sheet at inception. (Most swaps, forwards, and futures have a fair value of zero at inception, so do not appear on the balance sheet at inception.) As the price of the underlying stock changes, the value of the option changes.

Option valuation is a complex topic, well beyond the scope of this introduction to derivatives. For the case, option values at balance sheet dates are provided, based on the Black-Scholes option pricing model. The material presented here will be limited to a discussion of two components of an option's value: intrinsic value and time value.[18]

For an in-the-money put option[19] intrinsic value is the difference between the option's strike price (the price the seller of the option has agreed to pay for a share of stock if the purchaser decides to exercise the option) and the current market price of the stock. The put option has no intrinsic value if the stock's current market price is above the strike price. When the stock's current price is below the strike price, changes in the intrinsic value offset exactly any movements in the stock's price that remain below the strike price. That is, the intrinsic value portion of the purchased put option is a perfect hedge of changes in the stock's value due to price movements below the strike price. The option's intrinsic value does not hedge price changes when the stock's price is above the strike price.

The other portion of the option's value is its time value. The put option has time value because it is always possible the price of the stock will decline (farther) before the option expires, leading to increased intrinsic value. The time value of an option changes primarily due to factors related to decreasing time until expiration of the option.

Given the preceding paragraphs, it is clear a company may hedge stock investments[20] with purchased put options. However, the company will designate the change in intrinsic values of the options as a hedge of changes in stock values when only when stock price is *below* the strike price. Changes in stock values when the stock price is above the strike price are not hedged, and are accounted for under Statement 115. Changes in the time value component of the option will be excluded from determination of hedge effectiveness, and

[18] Option values can also be divided between intrinsic value, volatility value, and time value. Discussion of this division of option value is also beyond the scope of this introduction.

[19] A put option is said to be in-the-money when the reference stock's price is below the put option's strike price.

[20] Only equity investments classified as available for sale are eligible to be hedged. Statement 133 prohibits hedge accounting treatment for equity investments accounted for under the equity method of accounting, and does not allow assets already marked to market through income to be designated as hedged items.

will be reflected in net income. Changes in the intrinsic value component of the options will be included in net income, as will hedged price changes in fair value of the available for sale securities due to *hedged* price changes (that is, price changes below the option's strike price). The following journal entries would be used when stock price changes *below* the put option's strike price occur. (Whether specific account entries are debits or credits will depend on the specific stock price changes that occur.)

Purchased Options	XX	
Loss on Options (time value portion)	YY	
Gain on Hedging Options (intrinsic value portion)		ZZ
Loss on Available for Sale Securities	ZZ	
Available for Sale Securities		ZZ

Changes in fair value of the available for sale securities due to price changes above the option's strike price will continue to be reflected in OCI. Even when stock price changes above the option's strike price occur, there will be changes in the option's value, due to changes in time value. The following journal entries would record these changes. (Whether specific account entries are debits or credits will depend on the specific stock price changes that occur.)

Available for Sale Securities	XX	
OCI		XX
Loss on Options (time value portion)	YY	
Purchased Options		YY

The accounting for situations in which options are used as hedging instruments is illustrated in the third case, "Pimentel Cigar Company: Accounting for Options Hedging Equity Securities."

J. Adams and Company: Accounting for Interest Rate Swaps in a Horizontal Yield Curve Environment

Walter R. Teets

Robert Uhl

J. Adams and Company: Accounting for Interest Rate Swaps
in a Horizontal Yield Curve Environment

Walter R. Teets and Robert Uhl

J. Adams and Company, Inc., has just finished a risk management evaluation, and found only one item of concern: it has a mismatch in its interest-earning assets and its interest-paying liabilities. Both its investment in bonds and its long-term debt have principals of $1,000,000 due at maturity, are currently accruing interest at 8%, pay simple interest annually on December 31, and have maturities of three years (there are no premiums or discounts on either the bonds or the debt). However, the long-term debt is fixed-rate debt, while the bonds earn interest at a variable rate equal to one-year LIBOR.

The CEO has been hearing a lot about how derivatives, properly used, can insulate a company from the effects of interest rate changes. She has consulted the company's principle banker, who has indicated that a receive-fixed, pay-variable interest rate swap, with a notional amount of $1,000,000, would be the simplest way to protect the company against interest rate movements. The CEO has come to you, the chief accounting officer, for an explanation of how engaging in an interest rate swap would affect the company's financial statements. She understands accounting fairly well, and would like you to prepare journal entries and abbreviated financial statements for the next three years for the four strategies listed below. She would also like you to provide her with the standard deviations of net income, other comprehensive income, and accumulated other comprehensive income, under each of the following strategies. (Ignore taxes.)

1. Don't engage in an interest rate swap. This establishes a benchmark with which the other scenarios can be compared.

2. Undertake an interest rate swap, which will hedge the company economically, but don't designate the swap as a hedging instrument. (If the FASB had chosen not to allow hedge accounting for interest rate derivatives, this would be the accounting outcome of an economically reasonable hedge. Alternatively, if the company were using the swap for speculative purposes, this accounting treatment would be followed.)

3. Undertake the interest rate swap, and designate it as a fair value hedge. (What will Adams designate as the hedged item(s)?)

4. Undertake the interest rate swap, and designate it as a cash flow hedge. (What will Adams designate as the hedged item(s)?)

Use the following assumptions about the interest rate swap, the investment in bonds, and the long-term debt.

1. *Net* interest payments on the swap will be made annually, on December 31, for 3 years.

2. The fixed-rate leg of the swap is at 8%.

3. The variable leg of the swap and the variable rate investment both reprice each January 1. Interest paid or received December 31 is calculated using the previous January 1 rate.

4. Assume LIBOR on January 1 (and the preceding December 31) for the three years are 8%, 6%, and 10%.

5. The yield curve is horizontal at all times.

6. Use LIBOR as the discount rate.

7. Adams will follow the practice of recognizing all gains and losses on derivatives designated as cash flow hedges first in other comprehensive income (OCI). When the hedged item affects net income, a corresponding portion of the hedging derivative gain (loss) previously recognized in OCI must be reflected in net income. To avoid double-counting in comprehensive income, a reclassification adjustment is made that reduces (increases) other comprehensive income by an amount equal to the derivative gain (loss) recognized in net income.

8. The investment in bonds is classified as an Available For Sale (AFS) security.

9. Omit the entry reclassifying long-term debt to short-term at the end of 19X2.

Before attempting the journal entries and abbreviated financial statements, complete the following preparatory tasks.

1. Read "Summary of Accounting for Derivative Instruments and for Hedging Activities."

2. Determine the appropriate interest rate(s) to be used in determining the fair values of the interest rate swap, and changes in the fair values of the bonds payable. The following timeline may be of use in helping to understand the interest rate dynamics.

LIBOR: 8%		LIBOR: 6%		LIBOR: 10%	
1–1–X1	12–31–X1	1–1–X2	12–31–X2	1–1–X3	12–31–X3
Set Year 1 rates	Pay or receive interest; Prepare F/S	Set Year 2 rates	Pay or receive interest; Prepare F/S	Set Year 3 rates	Pay or receive interest and principal; Prepare F/S

3. Compute the fair value of the debt, the bonds, and the interest rate swap at 12–31–19X1, and 12–31–19X2.

Base Case—No Interest Rate Swap

Year 1			Year 2			Year 3		
Cash	80,000		Cash	60,000		Cash	100,000	
Interest Revenue		80,000	Interest Revenue		60,000	Interest Revenue		100,000
(Record interest on investment)			(Record interest on investment)			(Record interest on investment)		
Interest Expense	80,000		Interest Expense	80,000		Interest Expense	80,000	
Cash		80,000	Cash		80,000	Cash		80,000
(Record interest on debt)			(Record interest on debt)			(Record interest on debt)		
Interest Revenue	80,000		Interest Revenue	60,000		Bonds Payable	1,000,000	
Interest Expense		80,000	Retained Earnings	20,000		Cash		1,000,000
(Close nominal accounts)			Interest Expense		80,000	(Pay off Bonds Payable)		
			(Close nominal accounts)			Cash	1,000,000	
						AFS (Bonds)		1,000,000
						(Redeem AFS Bonds)		
						Interest Revenue	100,000	
						Interest Expense		80,000
						Retained Earnings		20,000
						(Close nominal accounts)		

Abbreviated Financial Statements

Income Statement		Income Statement		Income Statement	
Other Income		Other Income		Other Income	
Interest Revenue	80,000	Interest Revenue	60,000	Interest Revenue	100,000
Interest Expense	(80,000)	Interest Expense	(80,000)	Interest Expense	(80,000)
Total Other Income	–0–	Total Other Income	(20,000)	Total Other Income	20,000

Balance Sheet				Balance Sheet				Balance Sheet
AFS	1,000,000	Bonds Payable	1,000,000	Cash	(20,000)	Bonds Payable	1,000,000	No Effects Remaining
				AFS	1,000,000	Retained Earnings	(20,000)	

Summary Statistics (Population)

σ(Income) : 16,330

Suggested Answer Format

No Designation	Fair Value Hedge	Cash Flow Hedge

12–31–X1 Journal Entries
Cash _____
  Interest Revenue _____
  (Record interest on investment)
Interest Expense _____
  Cash _____
  (Record interest on debt)
Swap Receivable _____
  Gain on Swap _____
  (Record fair value of swap)
Interest Revenue _____
Gain on Swap _____
  Interest Expense _____
  Retained Earnings _____
  (Close nominal accounts)		

Abbreviated Financial Statements, Year 1

Income Statement	Income Statement	Income Statement

Other Income
  Interest Revenue _____
  Interest Expense (_____)
  Unrealized Gain (Swap) _____
  Total Other Income _____		

Balance Sheet	**Balance Sheet**	**Balance Sheet**
Swap Rec. _____ Bonds Payable _____ AFS _____ Retained Earnings _____		

No Designation			Fair Value Hedge			Cash Flow Hedge		
12–31–X1 Journal Entries								
Cash	80,000		Cash	80,000		Cash	80,000	
Interest Revenue		80,000	Interest Revenue		80,000	Interest Revenue		80,000
(Record interest on investment)			(Record interest on investment)			(Record interest on investment)		
Interest Expense	80,000		Interest Expense	80,000		Interest Expense	80,000	
Cash		80,000	Cash		80,000	Cash		80,000
(Record interest on debt)			(Record interest on debt)			(Record interest on debt)		
Swap Receivable[1]	36,668		Swap Receivable	36,668		Swap Receivable	36,668	
Unrealized Gain on Swap		36,668	Unrealized Gain on Swap		36,668	OCI		36,668
(Record fair value of swap)			(Record fair value of swap)			(Record fair value of swap)		
Interest Revenue	80,000		Unrealized Loss on B/P	36,668		Interest Revenue	80,000	
Unrealized Gain on Swap	36,668		Bonds Payable[2]		36,668	Interest Expense		80,000
Interest Expense		80,000	(Record change in fair			(Close nominal accounts		
Retained Earnings		36,668	value of hedged item)			(no Retained Earnings effect))		
(Close nominal accounts)			Interest Revenue	80,000		OCI	36,668	
			Unrealized Gain on Swap	36,668		Accumulated OCI		36,668
			Interest Expense		80,000	(Close OCI to AOCI)		
			Unrealized Loss on B/P		36,668			
			(Close nominal accounts					
			(no Retained Earnings effect))					

Abbreviated Financial Statements, Year 1

Income Statement		Income Statement		Income Statement	
Other Income		Other Income		Other Income	
Interest Revenue	80,000	Interest Revenue	80,000	Interest Revenue	80,000
Interest Expense	(80,000)	Interest Expense	(80,000)	Interest Expense	(80,000)
Unrealized Gain (Swap)	36,668	Unrealized Gain (Swap)[3]	36,668	Total Other Income	–0–
Total Other Income	36,668	Unrealized Loss (B/P)[3]	(36,668)	OCI	
		Total Other Income	–0–	Unrealized Gain on Swap	36,668

Balance Sheet				Balance Sheet				Balance Sheet			
Swap Rec.	36,668	Bonds		Swap Rec.	36,668	Bonds Payable	1,036,668	Swap Rec.	36,668	Bonds Payable	1,000,000
AFS	1,000,000	Payable	1,000,000	AFS	1,000,000			AFS	1,000,000	AOCI	36,668
		Retained									
		Earnings	36,668								

No Designation			Fair Value Hedge			Cash Flow Hedge		
12–31–X2 Journal Entries								
Cash	60,000		Cash	60,000		Cash	60,000	
Interest Revenue		60,000	Interest Revenue		60,000	Interest Revenue		60,000
(Record interest on investment)			(Record interest on investment)			(Record interest on investment)		
Interest Expense	80,000		Interest Expense	62,200		Interest Expense	80,000	
Cash		80,000	Bonds Payable	17,800		Cash		80,000
(Record interest on debt)			Cash		80,000	(Record interest on debt)		
Cash	20,000		(Record interest on debt			Swap Receivable[9]	2,200	
Interest Revenue[4]		2,200	6% × 1,036,668)			OCI[9]		2,200
Swap Receivable[5]		17,800	Cash	20,000		(Accrue interest on beginning		
(Record net receipt on swap)			Interest Revenue		2,200	swap receivable)		
Unrealized Loss on Swap	37,050		Swap Receivable		17,800	Cash[9]	20,000	
Swap Payable[6]		18,182	(Record net receipt on swap)			Swap Receivable[9]		20,000
Swap Receivable[7]		18,868	Unrealized Loss on Swap	37,050		(Record cash received from swap)		
(Record change in FV of swap)			Swap Payable		18,182	Reclassification		
Interest Revenue	62,200		Swap Receivable		18,868	Adjustment (OCI)	20,000	
Retained Earnings	54,850		(Record change in FV of swap)			Interest Revenue		20,000
Interest Expense		80,000	Bonds Payable[8]	37,050		(Reclassify OCI recognized in earnings)		
Unrealized Loss on Swap		37,050	Unrealized Gain on B/P		37,050	OCI	37,050	
(Close nominal accounts)			(Record change in fair			Swap Payable		18,182
			value of hedged item)			Swap Receivable		18,868
			Interest Revenue	62,200		(Record change in FV of swap)		
			Unrealized Gain on B/P	37,050		Interest Revenue	80,000	
			Interest Expense		62,200	Interest Expense		80,000
			Unrealized Loss on Swap		37,050	(Close nominal accounts)		
			(Close nominal accounts)			Accum. OCI	54,850	
						OCI		34,850
						Reclassification		
						Adjustment (OCI)		20,000
						(Close OCI components to AOCI)		

Abbreviated Financial Statements, Year 2

Income Statement		Income Statement		Income Statement	
Other Income		Other Income		Other Income	
Interest Revenue	62,200	Interest Revenue	62,200	Interest Revenue	80,000
Interest Expense	(80,000)	Interest Expense	(62,200)	Interest Expense	(80,000)
Unrealized Loss (Swap)	(37,050)	Unrealized Gain (B/P)[3]	37,050	Total Other Income	–0–
Total Other Income	(54,850)	Unrealized Loss (Swap)[3]	(37,050)	OCI	
		Total Other Income	–0–	Loss on Swap	(34,850)
				Reclassification	
				Adjustment	(20,000)
				OCI	(54,850)
Balance Sheet		Balance Sheet		Balance Sheet	
AFS 1,000,000	Swap Payable 18,182	AFS 1,000,000	Swap Payable 18,182	AFS 1,000,000	Swap Payable 18,182
	Bonds Payable 1,000,000		Bonds Payable 981,818		Bonds Payable 1,000,000
	Retained Earnings (18,182)				AOCI (18,182)

No Designation			Fair Value Hedge			Cash Flow Hedge		
12–31–X3 Journal Entries								
Cash	100,000		Cash	100,000		Cash	100,000	
Interest Revenue		100,000	Interest Revenue		100,000	Interest Revenue		100,000
(Record interest on investment)			(Record interest on investment)			(Record interest on investment)		
Interest Expense	80,000		Interest Expense	98,182		Interest Expense	80,000	
Cash		80,000	Bonds Payable		18,182	Cash		80,000
(Record interest on debt)			Cash		80,000	(Record interest on debt)		
Interest Expense[10]	1,818		(Record interest on LTD			OCI	1,818	
Swap Payable	18,182		10% × 981,818)			Swap Payable		1,818
Cash		20,000	Interest Expense	1,818		(Accrue interest on beginning		
(Pay off swap)			Swap Payable	18,182		swap payable)		
Bonds Payable	1,000,000		Cash		20,000	Swap Payable	20,000	
Cash		1,000,000	(Pay off swap)			Cash		20,000
(Pay off Bonds Payable)			Bonds Payable	1,000,000		(Record net payment on swap)		
Cash	1,000,000		Cash		1,000,000	Interest Expense	20,000	
AFS (Bonds)		1,000,000	(Pay off Bonds Payable)			Reclassification		
(Redeem AFS Bonds)			Cash	1,000,000		Adjustment (OCI)		20,000
Interest Revenue	100,000		AFS (Bonds)		1,000,000	(Reclassify OCI recognized in earnings)		
Interest Expense		81,818	(Redeem AFS Bonds)			Bonds Payable	1,000,000	
Retained Earnings		18,182	Interest Revenue	100,000		Cash		1,000,000
(Close nominal accounts)			Interest Expense		100,000	(Pay off Bonds Payable)		
			(Close nominal accounts)			Cash	1,000,000	
						AFS (Bonds)		1,000,000
						(Redeem AFS Bonds)		
						Interest Revenue	100,000	
						Interest Expense		100,000
						(Close nominal accounts)		
						Accum. OCI	18,182	
						OCI	1,818	
						Reclassification		
						Adjustment (OCI)		20,000
						(Close OCI components to AOCI)		

Abbreviated Financial Statements, Year 3

Income Statement		Income Statement		Income Statement	
Other Income		Other Income		Other Income	
Interest Revenue	100,000	Interest Revenue	100,000	Interest Revenue	100,000
Interest Expense	(81,818)	Interest Expense	(100,000)	Interest Expense	(100,000)
Total Other Income	18,182	Total Other Income	–0–	Total Other Income	–0–
				OCI	
				Loss on Swap	(1,818)
				Reclassification	
				Adjustment	20,000
				OCI	18,182
Balance Sheet		Balance Sheet		Balance Sheet	
No Effects Remaining		No Effects Remaining		No Effects Remaining	

No Designation	Fair Value Hedge	Cash Flow Hedge
Summary Statistics (Population)		
σ(Income) : 39,512	σ(Income) : 0	σ(Income) : 0 σ(OCI) : 39,512 σ(AOCI) : 22,812

Calculations and Notes on Journal Entries

1. Present value at 6% of expected cash receipts from swap of $20,000 each for 2 years (receive 8% × $100,000; pay 6% × $100,000).

2. Increase in bonds payable is calculated as follows. First, the fair value of the bonds is equal to the present value at 6% of two remaining interest payments of $80,000, plus the principal payment of $1,000,000 at the end of two years. This present value of $1,036,668 is compared to the ending carrying value of $1,000,000.

3. Unrealized gains and losses are often combined on the income statement, so might not be included at all in this example.

4. Record interest revenue on beginning balance of swap receivable 6% × $36,668.

5. Cash receipt of $20,000 pays interest revenue of $2,200 and reduces beginning balance of swap receivable.

6. Present value at 10% of expected cash payment on swap of $20,000 at end of 1 year (receive 8% × $100,000; pay 10% × $100,000).

7. Reduce remaining Swap Receivable to zero balance (beginning balance $36,668 less 12–31–X2 entry #3 credit of $17,800 = $18,868).

8. Decrease in bonds payable is calculated as follows. First, the fair value of the bonds is equal to the present value at 10% of the remaining interest payment of $80,000, plus the principal payment of $1,000,000 at the end of the year. This present value of $981,818 is compared to the ending carrying value of $1,018,868 (equal to beginning carrying value of $1,036,668 less "premium amortization" of $17,800).

9. These two entries and the corresponding entries for 19X3 might be combined. The entry would be

Cash	20,000	
OCI		2,200
Swap Receivable		17,800

10. Record interest expense on beginning balance of swap payable 10% × $18,182.

Gannonsan Micro-Brewery: Accounting for Forwards Hedging Foreign Currency Transactions

Walter R. Teets

Robert Uhl

Gannonsan Micro-Brewery: Accounting for Forwards
Hedging Foreign Currency Transactions

Walter R. Teets and Robert Uhl

Main Scenario:

The Gannonsan Micro-Brewery (GMB), a Japanese company, is experimenting with a new brew—Gannon Stout—as a local competitor to the famous Guinness. GMB's investigations have led to the determination that new equipment, including a stainless steel brewkettle, lauter tune, whirlpool, 6 fermenting and storage tanks, and a hot water tank, all of the highest quality, is needed. Such equipment has been located; it is produced by the German company Bierhaus GMBH, and is available through a distributor in Hong Kong. On November 1, 19X1, GMB signed a contract to purchase the equipment on March 31, 19X2, at a cost of 470,100 Hong Kong dollars (HK$), payable in HK$. GMB is concerned about foreign currency exchange rate movements over the contract period, and wishes to fix the price in yen, its functional currency. Therefore, the company enters into a forward to purchase HK$470,100 for ¥7,356,783, when the exchange rate for settlement on March 31, 19X2, is ¥15.6494 per HK$.

When the contract is signed, and the forward entered into, there are no journal entries. At that time, the forward contract has a value of zero, as does the firm commitment.

1. On December 31, 19X1, the ¥–HK$ forward exchange rate for settlement on March 31, 19X2, has changed to ¥17.0877 per HK$. Prepare required journal entries, and summary financial statements, showing the results of the change in exchange rates. Assume that GMB has determined that, in the long run, transparent financial statements will be beneficial, so will prepare statements in conformity with U.S. GAAP. (Ignore present value considerations in this case, both in the main scenario and the alternative scenarios.)

2. On March 31, 19X2, the spot exchange rate is ¥16.8333 per HK$. Make the required journal entries to (1) record the fair values of the firm commitment and forward; (2) reflect the settlement of the forward; and (3) record the purchase of the new equipment. Also, prepare summary financial statements reflecting the results of these transactions.

Alternative Scenarios:

A: Assume GMB has *not* entered into a firm commitment to purchase the equipment, but only forecasts the purchase of the equipment. Repeat requirements 1 and 2 above, assuming GMB enters into the ¥–HK$ hedge. In addition, prepare adjusting entries needed at 12–31–X2 to record depreciation and related items, assuming a ten-year useful life, no salvage, straight-line depreciation, and use of the half-year convention.

B: Assume again GMB has entered into a firm commitment, but will instead enter into a ¥–US$ forward in the amount of US$60,780 to hedge the HK$ firm commitment. Repeat requirements 1 and 2 above, assuming that in addition to the ¥–HK$ rates given above the ¥–US$ rates on November 1, December 31, and March 31 are 121.03954, 132.37000, and 130.45000. (Do not calculate depreciation expense.)

C: Finally, assume again that GMB has not entered into a firm commitment to purchase the equipment, but only forecasts the purchase of the equipment. Repeat requirements 1 and 2 above, assuming GMB enters into the ¥–US$ hedge. (Do not calculate depreciation expense.)

Hedging a Firm Commitment HK$ Purchase with a
¥:HK$ Forward—Main Scenario

Journal Entries, 12–31–X1 (in ¥)

Forward Contract	676,145	
Gain on Forward Contract		676,145
(To record the change in value of the forward contract (HK$470,100 × 15.6494¥:HK$)− (HK$470,100 × 17.0877¥:HK$))		
Loss on Firm Commitment	676,145	
Firm Commitment		676,145
(To record the change in value of the hedged item)		
Gain on Forward Contract	676,145	
Loss on Firm Commitment		676,145
(To close nominal accounts)		

Income Statement—Quarter Ending 12–31–X1	
Other Income	
Gain on Forward Contract	676,145
Loss on Firm Commitment	(676,145)
Total Other Income	0

Balance Sheet At 12–31–X1

Forward Contract	676,145	Firm Commitment	676,145

Journal entries, 3–31–X2 (in ¥)

Loss on Forward Contract	119,594	
Forward Contract		119,594
(To record the change in value of the forward contract (HK$470,100 × 17.0877¥:HK$)− (HK$470,100 × 16.8333¥:HK$))		
Firm Commitment	119,594	
Gain on Firm Commitment		119,594
(To record the change in value of the hedged item)		

Foreign Currency (HK$)	7,913,334	
Forward Contract		556,551
Cash		7,356,783
(To record settlement of the forward contract (HK$470,100 × 16.8333¥:HK$) and (HK$470,100 × 15.6494¥:HK$))		
Equipment	7,356,783	
Firm Commitment	556,551	
Foreign Currency (HK$)		7,913,334
(To record the purchase of the machine and close the Firm Commitment account)		
Gain on Forward Contract	119,594	
Loss on Firm Commitment		119,594
(To close nominal accounts)		

Income Statement—Quarter Ending 3–31–X2	
Other Income	
Loss on Forward Contract	(119,594)
Gain on Firm Commitment	119,594
Total Other Income	0

Balance Sheet At 3–31–X2

Cash	(7,356,783)
Equipment	7,356,783

Hedging a Forecasted HK$ Purchase with a
¥:HK$ Forward—Alternative Scenario A

Journal Entries, 12–31–X1 (in ¥)

Forward Contract	676,145	
OCI		676,145
(To record the change in value of the forward contract (HK$470,100 × 15.6494¥:HK$)− (HK$470,100 × 17.0877¥:HK$))		
OCI	676,145	
Accum. OCI		676,145
(To close nominal accounts)		

Income Statement—Quarter Ending 12–31–X1	
Net Income	0
Other Comprehensive Income	
Gain on Forward Contract	676,145
Total Comprehensive Income	676,145

Balance Sheet At 12–31–X1			
Forward Contract	676,145	AOCI	676,145

Journal entries, 3–31–X2 (in ¥)

OCI	119,594	
Forward Contract		119,594
(To record the change in value of the forward contract (HK$470,100 × 17.0877¥:HK$)− (HK$470,100 × 16.8333¥:HK$))		
Foreign Currency (HK$)	7,913,334	
Forward Contract		556,551
Cash		7,356,783
(To record settlement of the forward contract (HK$470,100 × 16.8333¥:HK$) and (HK$470,100 × 15.6494¥:HK$))		
Equipment	7,913,334	
Foreign Currency (HK$)		7,913,334
(To record the purchase of the machine HK$470, 100 × 16.8333¥:HK$)		
AOCI	119,594	
OCI		119,594
(To close nominal accounts)		

Income Statement—Quarter Ending 3–31–X2	
Net Income	0
Other Comprehensive Income	
Loss on Forward Contract	(119,594)
Total Comprehensive Income	(119,594)

Balance Sheet At 3–31–X2			
Cash	(7,356,783)	AOCI	556,551
Equipment	7,913,334		

Journal entries, 12–31–X2

Depreciation Expense	395,667	
Accumulated Depreciation		395,667
(To record depreciation, $(7{,}913{,}334 \div 10) \times .5$)		
Reclassification Adjustment (OCI)	27,828	
Depreciation Expense		27,828
(Reclassify OCI recognized in Earnings $(556{,}551 \div 10) \times .5$)		

Hedging a Firm Commitment HK$ Purchase with a
¥:US$ Forward—Alternative Scenario B

Preliminary Calculations

Firm Commitment	11–1–X1	12–31–X1	3–31–X2
Forward rate for settlement on 3–31–X2	15.6494	17.0877	16.8333
Firm commitment, HK$	(470,100)	(470,100)	(470,100)
¥ Value, current rate	(7,356,783)	(8,032,928)	(7,913,334)
¥ Value, original rate	(7,356,783)	(7,356,783)	(7,356,783)
Fair Value of FC	–0–	(676,145)	(556,551)
Change in Fair Value, gain (loss)		(676,145)	119,594

Forward Contract			
Forward rate for settlement on 3–31–X2	121.03954	132.37000	130.45000
Forward purchase, US$	60,780	60,780	60,780
¥ Value, current rates	7,356,783	8,045,449	7,928,751
¥ to be paid	7,356,783	7,356,783	7,356,783
Fair Value of Forward	–0–	688,666	571,968
Change in Fair Value, gain (loss)		688,666	(116,698)
Ineffectiveness		12,521	2,896

Journal Entries, 12–31–X1 (in ¥)

Forward Contract	688,666	
Gain on Forward Contract		688,666
(To record the change in value of the forward contract (US$60,780 × 121.03954¥:US$)− (US$60,780 × 132.37000¥:US$))		
Loss on Firm Commitment	676,145	
Firm Commitment		676,145
(To record the change in value of the hedged item (HK$470,100 × 15.6494¥:HK$)− (HK$470,100 × 17.0877¥:HK$))		
Gain on Forward Contract	688,666	
Retained Earnings		12,521
Loss on Firm Commitment		676,145
(To close nominal accounts)		

Income Statement—Quarter Ending 12–31–X1	
Other Income	
Gain on Forward Contract	688,666
Loss on Firm Commitment	(676,145)
Total Other Income	12,521

Balance Sheet At 12–31–X1			
Forward Contract	688,666	Firm Commitment	676,145
		Retained Earnings	12,521

Journal entries, 3–31–X2 (in ¥)

Loss on Forward Contract	116,698	
Forward Contract		116,698
(To record the change in value of the forward (US$60,780 × 132.37000¥:US$)− (US$60,780 × 130.45000¥:US$))		
Firm Commitment	119,594	
Gain on Firm Commitment		119,594
(To record the change in value of the hedged item (HK$470,100 × 17.0877¥:HK$)− (HK$470,100 × 16.8333¥:HK$))		
Foreign Currency (US$)	7,928,751	
Forward Contract		571,968
Cash		7,356,783
(To record the settlement of the forward contract (US$60,780 × 130.45000¥:US$) and (US$60,780 × 121.03954¥:US$))		
Cash	15,417	
Foreign Currency (HK$)	7,913,334	
Foreign Currency (US$)		7,928,751
(Convert US$ to HK$ needed; balance in ¥)		
Equipment	7,356,783	
Firm Commitment	556,551	
Foreign Currency (HK$)		7,913,334
(To record the purchase of the machine and close the Firm Commitment account)		
Gain on Firm Commitment	119,594	
Retained Earnings		2,896
Loss on Forward Contract		116,698
(To close nominal accounts)		

Income Statement—Quarter Ending 3–31–X2	
Other Income	
Loss on Forward Contract	(116,698)
Gain on Firm Commitment	119,594
Total Other Income	2,896

Balance Sheet At 3–31–X2

Cash	(7,341,366)	Retained Earnings	15,417
Equipment	7,356,783		

Hedging a Forecasted HK$ Purchase with a
¥:US$ Forward—Alternative Scenario C

Journal Entries, 12–31–X1 (in ¥)

Forward Contract	688,666	
OCI		676,145
Gain on Forward Contract		12,521
(To record the change in value of the forward contract (US$60,780 × 121.03954¥:US$)− (US$60,780 × 132.37000¥:US$))		
OCI	676,145	
Gain on Forward Contract	12,521	
Retained Earnings		12,521
Accum. OCI		676,145
(To close nominal accounts)		

Income Statement—Quarter Ending 12–31–X1	
Other Income	
Gain on Forward Contract	12,521
Total Other Income	12,521
Other Comprehensive Income	
Gain on Forward	676,145
Total Comprehensive Income	688,666

Balance Sheet At 12–31–X1			
Forward	688,666	AOCI	676,145
		Retained Earnings	12,521

Journal entries, 3–31–X2 (in ¥)

OCI	119,594	
Forward Contract		116,698
Gain on Forward Contract		2,896
(To record the change in value of the forward (US$60,780 × 132.37000¥:US$)− (US$60,780 × 130.45000¥:US$) and reclassify to earnings the remaining cumulative hedge ineffectiveness)		
Foreign Currency (US$)	7,928,751	
Forward Contract		571,968
Cash		7,356,783
(To record the settlement of the forward contract (US$60,780 × 130.45000¥:US$) and (US$60,780 × 121.03954¥:US$))		

Cash	15,417	
Foreign Currency (HK$)	7,913,334	
Foreign Currency (US$)		7,928,751
(Convert US$ to HK$ needed; balance in ¥)		
Equipment	7,913,334	
Foreign Currency (HK$)		7,913,334
(To record the purchase of the machine)		
AOCI	119,594	
Gain on Forward Contract	2,896	
Retained Earnings		2,896
OCI		119,594
(To close nominal accounts)		

Income Statement—Quarter Ending 3–31–X2	
Other Income	
Gain on Forward Contract	2,896
Total Other Income	2,896
Other Comprehensive Income	
Loss on Forward	(119,594)
Total Comprehensive Income	(116,698)

Balance Sheet At 3–31–X2

Cash	(7,341,366)	AOCI	556,551
Equipment	7,913,334	Retained Earnings	15,417

Pimentel Cigar Company: Accounting for Options Hedging Equity Securities

Walter R. Teets

Robert Uhl

Pimentel Cigar Company: Accounting for Options
Hedging Equity Securities

Walter R. Teets and Robert Uhl

Main Scenario:

The Pimentel Cigar Company owns 10,000 shares of JCN stock, with a cost of $400,000 and a market value of $1,000,000 on June 30, 19X1. Pimentel plans to use the proceeds from liquidating the shares to help finance a new cigar factory. The factory will be built during the second quarter of 19X2. Pimentel considered selling the shares immediately to lock in the gain of $600,000. However, Pimentel's tax department had determined Pimentel would have insufficient capital losses during 19X1 to offset the large capital gain if the shares were to be sold this year. For 19X2, sufficient capital losses are predicted. Pimentel's treasury department suggested exploring the possibility of using put options to lock in the gain.

The CFO of Pimentel, Mr. Armand, called an options dealer, and found there were no exchange-traded options on JCN stock, but that OTC options were a possibility. After additional investigation, Mr. Armand located a counterparty willing to sell Pimentel 10,000 put options, expiring on March 31, 19X2, at $3.21 each. On July 1, 19X1, Pimentel purchased the options at a total cost of $32,100. In order to keep the cost of the options down, the exercise price of the options was $95, slightly lower than the market price of the shares on that date, $100. Assume the company made the following entry on July 1, 19X1.

Purchased options	32,100	
Cash		32,100

Mr. Armand knew Pimentel would need to mark the options to market at each balance sheet date, and that the counterparty in the options transaction had used the Black-Scholes option pricing model to obtain the initial option value. In order to use the Black-Scholes model to price the options for future balance sheets, the standard deviation of returns to JCN shares would be needed. Upon inquiry, the counterparty told Mr. Armand the standard deviation used to determine the initial option value was 20% per year.

Under the requirements of Statement of Financial Accounting Standards No. 133 the put options were designated as a fair value hedge of the JCN stocks carried in the available-for-sale (AFS) portfolio. Pimentel decided that effectiveness of the hedge was to be assessed by comparing changes in the intrinsic value of the options with changes in the value of the shares. Since changes in the intrinsic value of the options will exactly offset decreases in stock value below $95, there will be no hedge ineffectiveness. Changes in the time value of the options, since they are excluded from determining hedge effectiveness, will be reported in earnings each period.

Prepare all accounting entries for the quarters ending 9–30–19X1, 12–31–19X1, and 3–31–19X2, related to the JCN stock and the options, assuming the following quarter-end stock prices. (Ignore the $600,000 change in the value of the JCN securities from initial purchase through June 30, 19X1. Assume for the accounting entries the cost of the securities was the $1,000,000 fair value at July 1, 19X1.)

Date	Price
9–30–19X1	$105
12–31–19X1	$94
3–31–19X2	$90

Assume the risk-free interest rate remains constant at 5%, and the standard deviation of returns does not change over the three-quarter period the options are held. Also, assume the values of the stocks and options are brought up to date immediately prior to exercising the options at the end of the day on March 31, 19X2.

After preparing all needed journal entries, determine the standard deviations of net income, other comprehensive income, and comprehensive income attributable to (1) changes in value of the JCN stock only, assuming no option transaction and hedging designation had occurred; (2) changes in value of the JCN stock and the *effective* portion of the hedge (that is, ignore all effects of changes in time value of the options); and (3) changes in value of the JCN stock and *all* changes in value of the options. (Calculate population standard deviations.)

Alternative Scenario:

Assume now that the exercise price was set at $100. All other facts remain the same, except, of course, that Pimentel paid more for the options on July 1. The journal entry made at that time was as follows.

Purchased options	50,900	
Cash		50,900

Prepare journal entries and calculate the standard deviations of income components, as before. Compare the results of hedging using the differing strategies (that is, purchasing options with exercise price equal to current stock price, versus exercise price below current stock price).

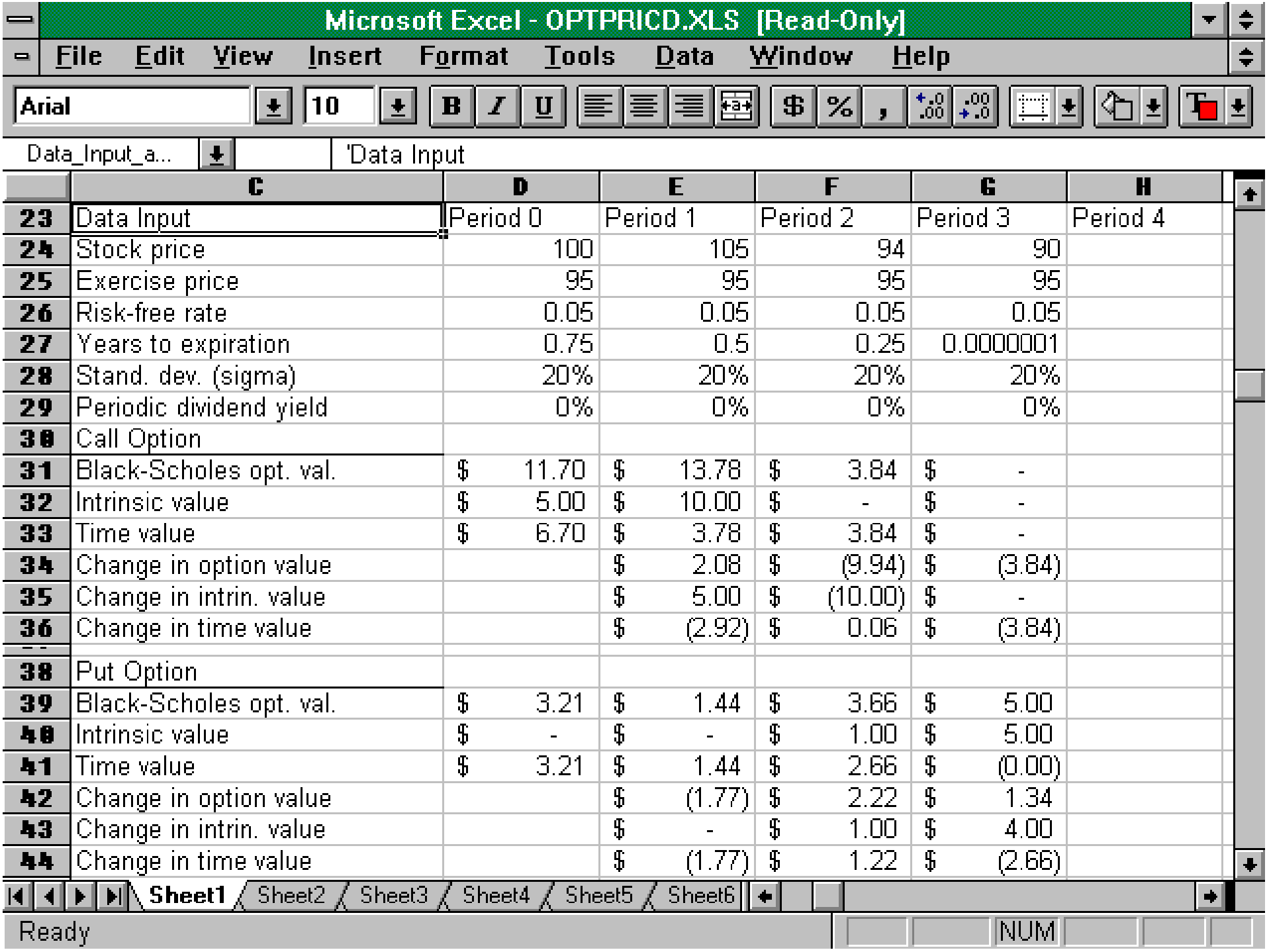
The Black-Scholes Option Pricing Model

The Black-Scholes option pricing model with continuous dividend yield y provides values C for a call option and P for a put option, according to the following formulae.

$$\begin{aligned} C &= Se^{-yt}N(d_1) - Ke^{-rt}N(d_2) \\ P &= Se^{-yt}[N(d_1) - 1] - Ke^{-rt}[N(d_2) - 1] \end{aligned}$$

where

$$\begin{aligned} C &= \text{value of call option} \\ P &= \text{value of put option} \\ S &= \text{current price of stock} \\ K &= \text{exercise price of option} \\ e &\approx 2.71828 \\ y &= \text{continuous dividend yield} \\ r &= \text{short-term interest rate} \\ t &= \text{years to expiration} \\ N(\cdot) &= \text{normal CDF} \\ d_1 &= \frac{\ln(Se^{-yt}/Ke^{-rt}) + \sigma^2 t/2}{\sigma\sqrt{t}} \\ d_2 &= d_1 - \sigma\sqrt{t} \\ \ln &= \text{natural logarithm} \\ \sigma &= \text{standard deviation of continuously compounded annual rate of return on stock} \end{aligned}$$



	C	D	E	F	G	H
23	Data Input	Period 0	Period 1	Period 2	Period 3	Period 4
24	Stock price	100	105	94	90	
25	Exercise price	95	95	95	95	
26	Risk-free rate	0.05	0.05	0.05	0.05	
27	Years to expiration	0.75	0.5	0.25	0.0000001	
28	Stand. dev. (sigma)	20%	20%	20%	20%	
29	Periodic dividend yield	0%	0%	0%	0%	
30	Call Option					
31	Black-Scholes opt. val.	$ 11.70	$ 13.78	$ 3.84	$ -	
32	Intrinsic value	$ 5.00	$ 10.00	$ -	$ -	
33	Time value	$ 6.70	$ 3.78	$ 3.84	$ -	
34	Change in option value		$ 2.08	$ (9.94)	$ (3.84)	
35	Change in intrin. value		$ 5.00	$ (10.00)	$ -	
36	Change in time value		$ (2.92)	$ 0.06	$ (3.84)	
38	Put Option					
39	Black-Scholes opt. val.	$ 3.21	$ 1.44	$ 3.66	$ 5.00	
40	Intrinsic value	$ -	$ -	$ 1.00	$ 5.00	
41	Time value	$ 3.21	$ 1.44	$ 2.66	$ (0.00)	
42	Change in option value		$ (1.77)	$ 2.22	$ 1.34	
43	Change in intrin. value		$ -	$ 1.00	$ 4.00	
44	Change in time value		$ (1.77)	$ 1.22	$ (2.66)	

Calculation of Changes in Option-Related Values—Main Scenario

Based on the Black-Scholes option pricing model for put options, assuming no dividends, a risk-free interest rate of 5%, a standard deviation of stock returns of 20%, and the sequence of prices given in the text, the options have the following values and changes in values at the quarter-ends.

Date	Option Value	Change from preceding quarter
7–1–19X1	$3.21	
9–30–19X1	$1.44	$(1.77)
12–31–19X1	$3.66	$2.22
3–31–19X2	$5.00	$1.34

The intrinsic value of a put option will be zero as long as the stock price is above the exercise price, and will be equal to the difference exercise price − stock price when the exercise price is above the stock price. Therefore, the following represent the intrinsic values and changes in intrinsic values at each quarter-end.

Date	Intrinsic Value	Change from preceding quarter
7–1–19X1	$0	
9–30–19X1	$0	$0
12–31–19X1	$1.00	$1.00
3–31–19X2	$5.00	$4.00

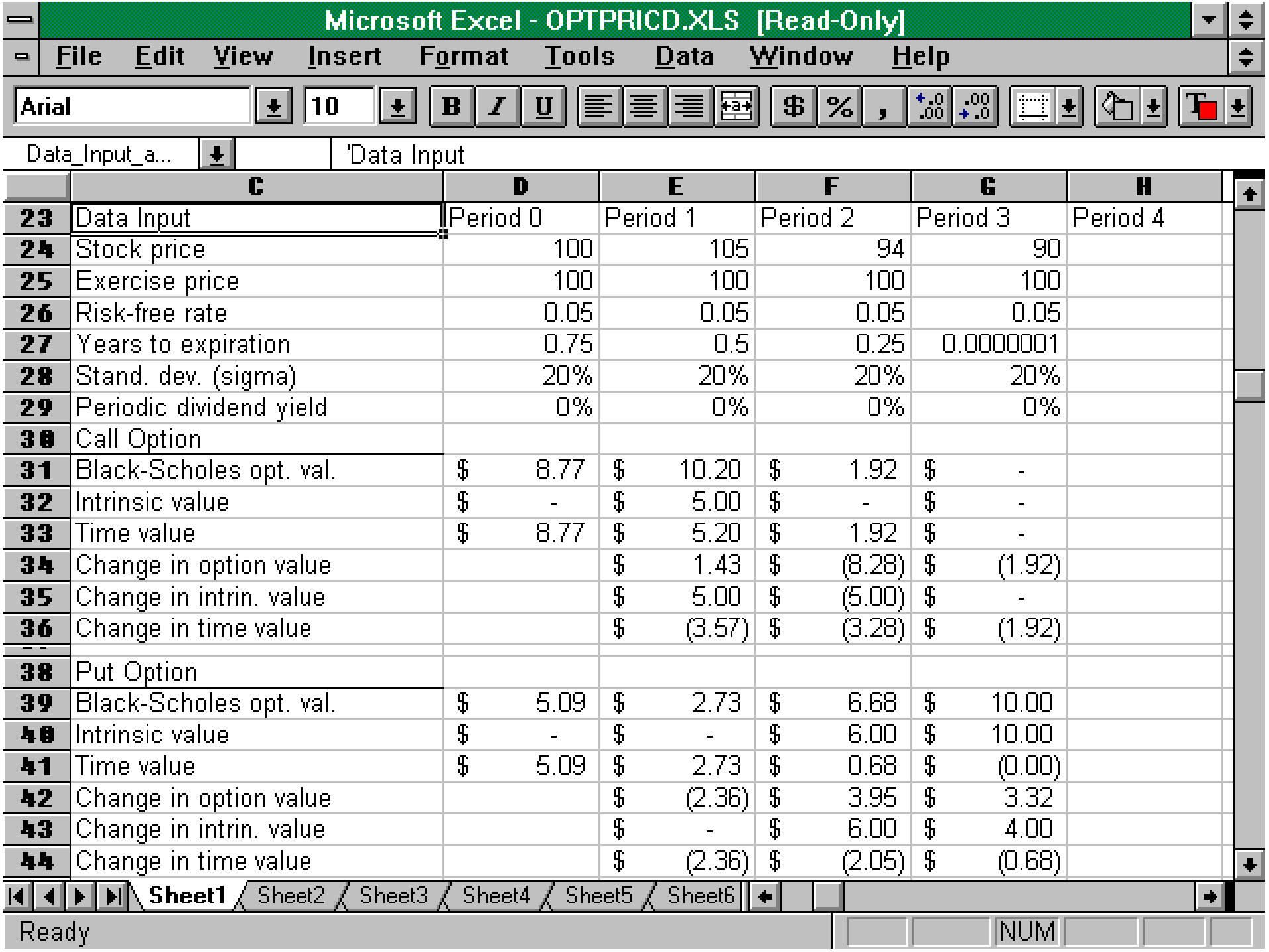
The time value of the option is equal to the option value less the intrinsic value. Therefore, the following are the time values and changes in time values at the quarter-ends.

Date	Time Value	Change from preceding quarter
7–1–19X1	$3.21	
9–30–19X1	$1.44	$(1.77)
12–31–19X1	$2.66	$1.22
3–31–19X2	$0	$(2.66)

9–30–19X1 Entries			12–31–19X1 Entries			3–31–19X2 Entries		
Loss on Options	17,700		Purchased Options	22,200		Purchased Options	13,400	
Purchased Options		17,700	Gain on Hedging Options		10,000	Loss on Options	26,600	
(Record change in value of options)			Gain on Options		12,200	Gain on Hedging Options		40,000
AFS Securities	50,000		(Split gain on options into effective and other portions)			(Split gain on option into effective and other portions)		
OCI		50,000	Unrealized Loss on Securities	10,000		Unrealized Loss on Securities	40,000	
(Record unhedged change in JCN stock value)			OCI	100,000		AFS Securities		40,000
OCI	50,000		AFS Securities		110,000	(Record change in JCN stock value)		
Retained Earnings	17,700		(Record change in JCN stock value 100,000 unhedged portion; 10,000 hedged)			Cash	950,000	
Loss on Options		17,700				Purchased Options		50,000
AOCI		50,000	AOCI	100,000		AFS Securities		900,000
(Close nominal accounts)			Gain on Hedging Options	10,000		(Record the exercise of the options)		
			Gain on Options	12,200		Loss on Sale of AFS Securities	50,000	
			Retained Earnings		12,200	Reclassification Adjustment (OCI)		50,000
			Unrealized Loss on Securities		10,000	(Reclassify realized loss on sale)		
			OCI		100,000	Gain on Hedging Options	40,000	
			(Close nominal accounts)			Retained Earnings	76,600	
						Reclassification Adjustment	50,000	
						Loss on Options		26,600
						Unrealized Loss on Securities		40,000
						Loss on Sale of AFS Securities		50,000
						AOCI		50,000
						(Close nominal accounts)		

Variability of Income Components:

Quarter Ending	JCN Stock, unhedged			JCN and effective portion			JCN and entire option		
	NI	OCI	CI	NI	OCI	CI	NI	OCI	CI
9–30–19X1	0	50,000	50,000	0	50,000	50,000	(17,700)	50,000	32,300
12–31–19X1	0	(110,000)	(110,000)	0	(100,000)	(100,000)	12,200	(100,000)	(87,800)
3–31–19X2	(100,000)	60,000	(40,000)	(50,000)	50,000	0	(76,600)	50,000	(26,600)
Stand. dev.	47,140	77,889	65,490	23,570	70,711	62,361	36,891	70,711	49,034



	C	D	E	F	G	H
23	Data Input	Period 0	Period 1	Period 2	Period 3	Period 4
24	Stock price	100	105	94	90	
25	Exercise price	100	100	100	100	
26	Risk-free rate	0.05	0.05	0.05	0.05	
27	Years to expiration	0.75	0.5	0.25	0.0000001	
28	Stand. dev. (sigma)	20%	20%	20%	20%	
29	Periodic dividend yield	0%	0%	0%	0%	
30	Call Option					
31	Black-Scholes opt. val.	$ 8.77	$ 10.20	$ 1.92	$ -	
32	Intrinsic value	$ -	$ 5.00	$ -	$ -	
33	Time value	$ 8.77	$ 5.20	$ 1.92	$ -	
34	Change in option value		$ 1.43	$ (8.28)	$ (1.92)	
35	Change in intrin. value		$ 5.00	$ (5.00)	$ -	
36	Change in time value		$ (3.57)	$ (3.28)	$ (1.92)	
38	Put Option					
39	Black-Scholes opt. val.	$ 5.09	$ 2.73	$ 6.68	$ 10.00	
40	Intrinsic value	$ -	$ -	$ 6.00	$ 10.00	
41	Time value	$ 5.09	$ 2.73	$ 0.68	$ (0.00)	
42	Change in option value		$ (2.36)	$ 3.95	$ 3.32	
43	Change in intrin. value		$ -	$ 6.00	$ 4.00	
44	Change in time value		$ (2.36)	$ (2.05)	$ (0.68)	

Calculation of Changes in Option-Related Values—Alternative Scenario

Option values and changes in values:

Date	Option Value	Change from preceding quarter
7–1–19X1	$5.09	
9–30–19X1	$2.73	$(2.36)
12–31–19X1	$6.68	$3.95
3–31–19X2	$10.00	$3.32

The intrinsic value of a put option will be zero as long as the stock price is above the exercise price, and will be equal to the difference exercise price − stock price when the exercise price is above the stock price. Therefore, the following represent the intrinsic values and changes in intrinsic values at each quarter-end.

Date	Intrinsic Value	Change from preceding quarter
7–1–19X1	$0	
9–30–19X1	$0	$0
12–31–19X1	$6.00	$6.00
3–31–19X2	$10.00	$4.00

The time value of the option is equal to the option value less the intrinsic value. Therefore, the following are the time values and changes in time values at the quarter-ends.

Date	Time Value	Change from preceding quarter
7–1–19X1	$5.09	
9–30–19X1	$2.73	$(2.36)
12–31–19X1	$.68	$(2.05)
3–31–19X2	$0	$(.68)

9–30–19X1 Entries			12–31–19X1 Entries			3–31–19X2 Entries		
Loss on Options	23,600		Purchased Options	39,500		Purchased Options	33,200	
Purchased Options		23,600	Loss on Options	20,500		Loss on Options	6,800	
(Record change in value of options)			Gain on Hedging Options		60,000	Gain on Hedging Options		40,000
AFS Securities	50,000		(Split gain on options into effective and other portions)			(Split gain on option into effective and other portions)		
OCI		50,000	Unrealized Loss on Securities	60,000		Unrealized Loss on Securities	40,000	
(Record change in JCN stock value)			OCI	50,000		AFS Securities		40,000
OCI	50,000		AFS Securities		110,000	(Record change in JCN stock value)		
Retained Earnings	23,600		(Record change in JCN stock value)			Cash	950,000	
Loss on Options		23,600	Gain on Hedging Options	60,000		Purchased Options		50,000
AOCI		50,000	Retained Earnings	20,500		AFS Securities		900,000
(Close nominal accounts)			AOCI	50,000		(Record the exercise of the options)		
			Loss on Options		20,500	Gain on Hedging Options	40,000	
			Unrealized Loss on Securities		60,000	Retained Earnings	6,800	
			OCI		50,000	Loss on Options		6,800
			(Close nominal accounts)			Unrealized Loss on Securities		40,000
						(Close nominal accounts)		

Variability of Income Components:

Quarter	JCN Stock, unhedged			JCN and effective portion			JCN and entire option		
Ending	NI	OCI	CI	NI	OCI	CI	NI	OCI	CI
9–30–19X1	0	50,000	50,000	0	50,000	50,000	(23,600)	50,000	26,400
12–31–19X1	0	(110,000)	(110,000)	0	(50,000)	(50,000)	(20,500)	(50,000)	(70,500)
3–31–19X2	(100,000)	60,000	(40,000)	0	0	0	(6,800)	0	(6,800)
Stand. dev.	47,140	77,889	65,490	0	40,825	40,825	7,299	40,825	40,207

C.L. Smith and Sons: Accounting for Futures Hedging Commodity Purchases and Sales

Walter R. Teets Robert Uhl

C.L. Smith and Sons: Accounting for Futures
Hedging Commodity Purchases and Sales

Walter R. Teets and Robert Uhl

Main Scenario:

C.L. Smith and Sons, based in Toledo, Ohio, processes soybeans into soybean oil and soybean meal. During the past year, Smith and Sons was hurt by fluctuating bean, oil, and meal prices, and would like to lock in the crush margin[21] to avoid a repetition of the problem. Mr. Smith, the manager and owner, took a class recently through the state university's extension program about using futures to insulate businesses from fluctuations in prices of various commodities. Entering into July, August, and September futures for purchase of soybeans (referred to as long positions) would allow him to lock in the purchase price for soybeans. Also, he could enter into August, September, and October futures for sales of soybean oil and soybean meal (referred to as short positions), to lock in finished product prices. The Smith and Sons processing plant can crush 1,000 tons of beans per day, resulting in approximately 183 tons of soybean oil and 800 tons of soybean meal.

Assume that on April 1, 19X1 Mr. Smith takes long positions in July, August, and September soybean futures[22], entering into enough contracts to hedge approximately 70% of the plant's expected monthly production requirements (assume 22 days per month and 60 pounds of soybeans per bushel). He also takes short positions in August, September, and October soybean oil and soybean meal positions, again entering into enough contracts to cover 70% of the oil and meal expected to be produced during the month. Assume that Mr. Smith net cash settles[23] the relevant futures positions on the last trading day of the month prior to the month the futures contracts mature. That is, he settles the July soybeans contracts by paying or receiving in cash the fair value of the contracts on the last business day of June. In that way, he does not risk having to take physical delivery of the soybeans under the futures contract; instead, he will buy soybeans from a local farmer at the prevailing cash price. Similarly, he net cash settles the soybean oil and meal contracts prior to the delivery month, to avoid potential problems associated with thin markets. Assume the contract prices are set at inception at the prevailing forward prices for the relevant maturities, so there is no cost April 1 to enter into the futures (ignore margin requirements). Finally, assume Mr. Smith designates the changes in value of the futures due to changes in spot prices as cash flow hedges of the anticipated purchases of soybeans, and anticipated sales of soybean oil and soybean meal.[24] Changes in value of the futures due to changes in the difference between the spot price and the futures price will be reflected immediately in income.

[21]The crush margin is the difference between the cost of a bushel of soybeans and the combined revenue from the soybean oil and meal produced from a bushel of soybeans. For additional institutional detail related to soybeans and related products, see *Soy Importers' Handbook* at http://www.pacweb.net.sg/asa/technical/soy.html.

[22]Appendix A provides information on various futures contracts, as well as prices needed to complete requirements of this case.

[23]The actual settlement method for futures involves entering into offsetting futures contracts which are netted by the futures exchange at the end of the day. Bringing this additional institutional detail into the solution of the case would not add significantly to understanding of the accounting for futures contracts.

[24]Assume the anticipated purchases and sales meet all requirements necessary to be designated as the hedged items.

Required:

1. Prepare a summary journal entry to show the effects of April, May, and June price changes on the futures contracts. Show calculations in good form. Assume the appropriate interest rate to be used in determining the fair values of the futures contracts is 0.5% per month. Also assume Smith and Sons follows the practice of accounting for long futures positions in the "Long Futures Contracts" account, and short positions in the "Short Futures Contracts" account. (Do not show the effect of the net cash settlement of the July bean futures in this entry.)

2. Prepare the entry recording the net cash settlement of the July bean contracts.

3. Prepare all journal entries related to soybeans, soybean oil, and soybean meal hedging, and purchase and sales activity, for July, August, September, and October, assuming the following schedule of purchases and sales. Ignore any additional production costs, and assume the company uses FIFO for inventory costing.

Purchase and Sale Data

	July	August	September	October
Tons of soybeans purchased	22,000	22,000	22,000	
Price per ton	$256	$255	$222	
Tons of soybean oil sold		4,026	4,026	4,026
Price per ton		$446	$454	$470
Tons of soybean meal sold		17,600	17,600	17,600
Price per ton		$256	$259	$205

4. Prepare a schedule computing the expected gross margin based on spot prices of April 1, when the futures contracts were initiated. Base this schedule on the units hedged with the futures contracts. Next, prepare a schedule of actual gross margin achieved, based on actual prices. Since only 70% of purchases and sales were hedged with futures, prepare this schedule based on only 70% of actual purchases and sales made. Third, prepare a schedule showing the effects of the hedging strategy (effective part only) on the gross margin. Finally, determine the actual gross margin plus the effects of hedging. Use the format on the following page.

	August	September	October	Total
Sales, based on April spot prices				
Soybean Oil				
Soybean Meal				
Total Revenue				
COGS, based on April spot prices				
Soybeans				
Gross margin, based on April spot prices				
Sales (70%), based on actual prices				
COGS (70%), based on actual prices				
Gross margin (70%), based on actual prices				
Hedge effect on sales				
Hedge effect on COGS				
Hedge effect on Gross margin				
Actual gross margin plus effects of hedging				

5. Discuss briefly the effectiveness of the hedging strategy (do not attempt to determine why the actual gross margin plus effect of hedge does not match the expected gross margin). Did C.L. Smith and Sons benefit overall, or would they have been better off not hedging?

6. *Optional:* Why does the actual gross margin plus effect of hedge not exactly match the expected gross margin?

Appendix A

Futures Symbols

BO	Soybean Oil
S	Soybeans
SM	Soybean Meal

Contract Specifications

Commodity Type (Symbol)	Soybeans (S)	Soybean Oil (BO)	Soybean Meal (SM)
Exchange Name	CBT[1]	CBT	CBT
Delivery Months	F,H,K,N,Q,U,X	F,H,K,N,Q,U,V,Z	F,H,K,N,Q,U,V,Z
Contract Unit	5,000 bu.	60,000 lbs.	100 tons
Price Quoted In	¢/bu.	¢/lb.	$/ton
Minimum Fluctuation	$.0025/bu.	$.0001/lb.	$.10/ton
$ Value of Minimum Tick	12.50	6.00	10.00
$ VALUE OF 1¢ Move	50	600	1
First Delivery Day	1st business day	1st business day	1st business day

[1]Chicago Board of Trade

Key to Contract Months

1st Year	Month	2nd Year	1st Year	Month	2nd Year	1st Year	Month	2nd Year
F	January	A	K	May	E	U	September	P
G	February	B	M	June	F	V	October	R
H	March	C	N	July	L	X	November	S
J	April	D	Q	August	O	Z	December	T

Relevant Spot and Futures Prices

Symbol	Date	Spot Price	Contract	Futures Price
BO	04/01/19X1	24.26	Q19X1	24.77
			U19X1	24.86
			V19X1	24.97
S	04/01/19X1	821.75	N19X1	878.5
			Q19X1	855.75
			U19X1	762.5
SM	04/01/19X1	272.8	Q19X1	277
			U19X1	256
			V19X1	229.5
BO	04/30/19X1	24.9	Q19X1	25.61
			U19X1	25.68
			V19X1	25.65

Relevant Spot and Futures Prices (continued)

Symbol	Date	Spot Price	Contract	Futures Price
S	04/30/19X1	880.25	N19X1	887
			Q19X1	860.25
			U19X1	767.75
SM	04/30/19X1	289.9	Q19X1	274.9
			U19X1	255.9
			V19X1	229.5
BO	05/31/19X1	23.51	Q19X1	23.96
			U19X1	24.12
			V19X1	24.05
S	05/31/19X1	864.75	N19X1	880.5
			Q19X1	830.75
			U19X1	732.5
SM	05/31/19X1	304.5	Q19X1	269.8
			U19X1	247.7
			V19X1	233.2
BO	06/30/19X1	21.42	Q19X1	21.95
			U19X1	22.02
			V19X1	22.13
S	06/30/19X1	768	N19X1	771
			Q19X1	718.25
			U19X1	644
SM	06/30/19X1	244.2	Q19X1	235.2
			U19X1	216.4
			V19X1	205.9
BO	07/31/19X1	22.3	Q19X1	22.35
			U19X1	22.56
			V19X1	22.73
S	07/31/19X1	765	Q19X1	768
			U19X1	685
SM	07/31/19X1	256	Q19X1	258.4
			U19X1	233.8
			V19X1	221.5
BO	08/31/19X1	22.7	U19X1	22.6
			V19X1	22.84
S	08/31/19X1	667	U19X1	666
SM	08/31/19X1	258.9	U19X1	255.5
			V19X1	221.4
BO	09/30/19X1	23.5	V19X1	23.6
SM	09/30/19X1	205.4	V19X1	205.4

	A	B	C	D	E	F	G
1	Periodic interest rate (a)		0.50%				
2							
3	Soybeans						
4	Units in contract (b)	5000					
5	Contracts (c)	103					
6	Total quantity (d)	515000					
7			July	August	September		
8	Future Contract Price		8.785	8.5575	7.625		
9	Original Spot Price		8.2175	8.2175	8.2175		
10	Month to Exp at 6/30 (e)		0	1	2		
11							
12	June 30						
13	Future price		7.71	7.1825	6.44		
14	Spot price		7.68	7.68	7.68		
15	Months from Jun30 (f)		0	0	0		
16	FVd(fut) (g)		-553625	-704602	-604218		
17	FVd(spot) (h)		-276813	-275435	-274065	Dr/(Cr)	
18	FVd(fut-spot) (i)		-276812	-429167	-330153		
19	dFVd(fut) (j)		(553,625)	(704,602)	(604,218)	(1,862,445)	(FC Asset/liab effect)
20	dFVd(spot) (j)		276,813	275,435	274,065	826,313	(OCI effect)
21	dFVd(fut-spot) (j)		276,812	429,167	330,153	1,036,132	(Net Income effect)
22							
23	July 31						
24	Future price			7.68	6.85		
25	Spot price			7.65	7.65		
26	Months from Jun30			1	1		
27	FVd(fut)			-451913	-397139		
28	FVd(spot)			-292262	-290808	Dr/(Cr)	
29	FVd(fut-spot)			-159651	-106331		
30	dFVd(fut) (k)			252,689	207,079	459,768	(FC Asset/liab effect)
31	dFVd(spot) (k)			16,827	16,743	33,570	(OCI effect)
32	dFVd(fut-spot) (k)			(269,516)	(223,822)	(493,338)	(Net Income effect)
33							
34	August 31						
35	Future price				6.66		
36	Spot price				6.67		
37	Months from Jun30				2		
38	FVd(fut)				-496975		
39	FVd(spot)				-796963	Dr/(Cr)	
40	FVd(fut-spot)				299,988		
41	dFVd(fut)				(99,836)	(99,836)	(FC Asset/liab effect)
42	dFVd(spot)				506,155	506,155	(OCI effect)
43	dFVd(fut-spot)				(406,319)	(406,319)	(Net Income effect)

	A	B	C	D	E	F	G
44	Soybean Oil						
45	Units in contract	60000					
46	Contracts	94					
47	Total quantity	5640000					
48			August	September	October		
49	Future Contract Price		0.2477	0.2486	0.2497		
50	Original Spot Price		0.2426	0.2426	0.2426		
51	Month to Exp at 6/30 (e)		1	2	3		
52							
53	June 30						
54	Future price		0.2195	0.2202	0.2213		
55	Spot price		0.2142	0.2142	0.2142		
56	Months from Jun30 (f)		0	0	0		
57	FVd(fut) (l)		158257	158586	157797		
58	FVd(spot) (m)		159379	158586	157797	Dr/(Cr)	
59	FVd(fut-spot) (n)		-1122	0	0		
60	dFVd(fut)		158,257	158,586	157,797	474,640	(FC Asset/liab effect)
61	dFVd(spot)		(159,379)	(158,586)	(157,797)	(475,762)	(OCI effect)
62	dFVd(fut-spot)		1,122	-	-	1,122	(Net Income effect)
63							
64	July 31						
65	Future price		0.2235	0.2256	0.2273		
66	Spot price		0.223	0.223	0.223		
67	Months from Jun30		1	1	1		
68	FVd(fut)		136488	129075	125082		
69	FVd(spot)		110544	109994	109447	Dr/(Cr)	
70	FVd(fut-spot)		25944	19081	15635		
71	dFVd(fut)		(21,769)	(29,511)	(32,715)	(83,995)	(FC Asset/liab effect)
72	dFVd(spot)		48,835	48,592	48,350	145,777	(OCI effect)
73	dFVd(fut-spot)		(27,066)	(19,081)	(15,635)	(61,782)	(Net Income effect)
74							
75	August 31						
76	Future price			0.226	0.2284		
77	Spot price			0.227	0.227		
78	Months from Jun30			2	2		
79	FVd(fut)			127464	119534		
80	FVd(spot)			87984	87546	Dr/(Cr)	
81	FVd(fut-spot)			39480	31988		
82	dFVd(fut)			(1,611)	(5,548)	(7,159)	(FC Asset/liab effect)
83	dFVd(spot)			22,010	21,901	43,911	(OCI effect)
84	dFVd(fut-spot)			(20,399)	(16,353)	(36,752)	(Net Income effect)
85							
86	September 30						
87	Future price				0.236		
88	Spot price				0.235		
89	Months from Jun30				3		
90	FVd(fut)				77268		
91	FVd(spot)				42864	Dr/(Cr)	
92	FVd(fut-spot)				34404		
93	dFVd(fut)				(42,266)	(42,266)	(FC Asset/liab effect)
94	dFVd(spot)				44,682	44,682	(OCI effect)
95	dFVd(fut-spot)				(2,416)	(2,416)	(Net Income effect)

	A	B	C	D	E	F	G
96	Soybean Meal						
97	Units in contract	100					
98	Contracts	124					
99	Total quantity	12400					
100			August	September	October		
101	Future Contract Price		277	256	229.5		
102	Original Spot Price		272.8	272.8	272.8		
103	Month to Exp at 6/30 (e)		1	2	3		
104							
105	June 30						
106	Future price		235.2	216.4	205.9		
107	Spot price		244.2	244.2	244.2		
108	Months from Jun30 (f)		0	0	0		
109	FVd(fut) (l)		515741	486166	288294		
110	FVd(spot) (m)		352876	351120	349373	Dr/(Cr)	
111	FVd(fut-spot) (n)		162865	135046	-61079		
112	dFVd(fut)		515,741	486,166	288,294	1,290,201	(FC Asset/liab effect)
113	dFVd(spot)		(352,876)	(351,120)	(349,373)	(1,053,369)	(OCI effect)
114	dFVd(fut-spot)		(162,865)	(135,046)	61,079	(236,832)	(Net Income effect)
115							
116	July 31						
117	Future price		258.4	233.8	221.5		
118	Spot price		256	256	256		
119	Months from Jun30		1	1	1		
120	FVd(fut)		230640	273910	98215		
121	FVd(spot)		208320	207284	206252	Dr/(Cr)	
122	FVd(fut-spot)		22320	66626	-108037		
123	dFVd(fut)		(285,101)	(212,256)	(190,079)	(687,436)	(FC Asset/liab effect)
124	dFVd(spot)		144,556	143,836	143,121	431,513	(OCI effect)
125	dFVd(fut-spot)		140,545	68,420	46,958	255,923	(Net Income effect)
126							
127	August 31						
128	Future price			255.5	221.4		
129	Spot price			258.9	258.9		
130	Months from Jun30			2	2		
131	FVd(fut)			6200	99940		
132	FVd(spot)			172360	171502	Dr/(Cr)	
133	FVd(fut-spot)			-166160	-71562		
134	dFVd(fut)			(267,710)	1,725	(265,985)	(FC Asset/liab effect)
135	dFVd(spot)			34,924	34,750	69,674	(OCI effect)
136	dFVd(fut-spot)			232,786	(36,475)	196,311	(Net Income effect)
137							
138	September 30						
139	Future price				205.4		
140	Spot price				205.4		
141	Months from Jun30				3		
142	FVd(fut)				298840		
143	FVd(spot)				835760	Dr/(Cr)	
144	FVd(fut-spot)				-536920		
145	dFVd(fut)				198,900	198,900	(FC Asset/liab effect)
146	dFVd(spot)				(664,258)	(664,258)	(OCI effect)
147	dFVd(fut-spot)				465,358	465,358	(Net Income effect)

Notes to Spreadsheet Calculating Fair Values
and Changes in Fair Values

These notes contain (1) a description of the values in the rows associated with the note, and in some cases, (2) the formula used to calculate the value shown in the cell to which the first occurrence of the note is related.

(a) The periodic interest rate is used to discount expected cash flows to determine fair values of the futures. It is assumed to be 6% per year, or .5% per month.

(b) Futures prices are quoted in different units. Soybeans are quoted in cents per bushel, soybean oil is quoted in cents per pound, and soybean meal is quoted in dollars per ton. This cell, and the following two cells, are used to determine how many units in total of soybeans, soybean oil, and soybean meal are involved under the futures contracts each month. For soybeans, there are 5,000 bushels in a contract; for soybean oil, 60,000 pounds; and for soybean meal, 100 tons.

(c) Contracts entered into per hedging month are determined by taking the number of tons of input or output per day of each commodity listed in the text, converting to monthly requirements by multiplying by 22 days per month, converting that to the appropriate contract units (bushels, pounds, or tons), dividing that by the number of units per contract, and multiplying by .7, since Smith and Sons is hedging only 70% of purchase and sales requirements.

B5: $= \text{ROUNDUP}(((1000\frac{\text{tons}}{\text{day}} * 2000\frac{\text{pounds}}{\text{ton}} * 22\frac{\text{days}}{\text{month}})/(60\frac{\text{pounds}}{\text{bushel}} * 5000\frac{\text{bushels}}{\text{contract}})) \times .7, 0)$

B46: $= \text{ROUNDUP}(((183\frac{\text{tons}}{\text{day}} * 2000\frac{\text{pounds}}{\text{ton}} * 22\frac{\text{days}}{\text{month}})/60000\frac{\text{pounds}}{\text{contract}}) \times .7, 0)$

B98: $= \text{ROUNDUP}(((800\frac{\text{tons}}{\text{day}} * 22\frac{\text{days}}{\text{month}})/100\frac{\text{tons}}{\text{contract}}) \times .7, 0)$

(d) The total quantity of units (bushels, pounds, or tons) hedged per month. Changes in futures or spot prices are multiplied by these quantities to determine the undiscounted value of futures contracts due to price changes.

(e) Months to maturity of the contract at June 30, the first date for which calculations/journal entries are required. In conjunction with the number described in note f, this is used to determine how many periods cash flows should be discounted. The assumption used in this case is that July futures effectively mature at the end of June, since holding them past that point could result in Smith having to take physical delivery of the beans, or could result in liquidity problems, in the case of the soybean oil and meal.

(f) Specifies how many months the calculation date is from June 30, the first date for which calculations/journal entries are required. In conjunction with the number described in note e, it is used to determine how many periods cash flows should be discounted. See note e for additional assumptions.

(g) Calculation of the fair value of the futures contracts due to a change between the price specified in the futures contracts, and the current futures price. The change in futures prices is multiplied by the total units under contract, then discounted for

the appropriate time period. Smith and Sons is long soybeans, so if futures prices go down, the futures are a liability. They are short soybean oil and soybean meal, so if futures prices decline, the futures are assets. This explains the leading minus sign in the formula for soybeans.

$$\textbf{C16:}\ = \mathrm{ROUND}(-((\ \underbrace{(C8-C13)}_{\substack{\text{Difference between}\\ \text{original and current}\\ \text{futures prices}}}\ *\ \overbrace{B6}^{\substack{\text{Total}\\ \text{units}}}\ )/(\underbrace{(1+C1)}_{\substack{\text{Discount}\\ \text{factor}}}\ \hat{}\ \overbrace{(C10-C15)}^{\substack{\text{Number of per-}\\ \text{iods to discount}}}\ )),0)$$

(h) Calculation of the portion of the fair value of the futures contracts due to a change between the spot price at the time the future was entered into, and the current spot price. The change in spot prices is multiplied by the total units under contract, then discounted for the appropriate time period. Changes in this amount are designated by Smith and Sons as hedging variability in cash flows of the anticipated transactions, measured by discounted changes in the spot prices.

$$\textbf{C17:}\ = \mathrm{ROUND}(-((\ \underbrace{(C9-C14)}_{\substack{\text{Difference between}\\ \text{original and current}\\ \text{spot prices}}}\ *\ \overbrace{B6}^{\substack{\text{Total}\\ \text{units}}}\ )/(\underbrace{(1+C1)}_{\substack{\text{Discount}\\ \text{factor}}}\ \hat{}\ \overbrace{(C10-C15)}^{\substack{\text{Number of per-}\\ \text{iods to discount}}}\ )),0)$$

(i) The portion of the fair value of the futures due to a change in the difference between the futures and spot prices at inception of the futures, and the current futures and spot prices. This portion is effectively the difference between the fair value due to a change in futures prices (see note g) and the portion of the fair value due to a change in spot prices (see note h). Any change in the relation between futures and spot price will not be effective in hedging changes in cash flows of the anticipated transaction, measured by discounted changes in spot prices. Changes in these values are reflected immediately in net income.

(j) Since the futures had zero fair value at inception, at this first measurement date, the changes in fair values are equal to the entire fair values described in notes g, h, and i.

(k) In periods subsequent to the first measurement date of the fair values of the futures and their components, the changes in values are simply the current fair values less the preceding month's fair values.

(l) Smith and Sons is short soybean oil and soybean meal. This explains the leading minus sign in cell C16 that is missing in cells C57 and C109. See note g for additional details relating to this amount.

(m) See notes h and l.

(n) See notes i and l.

Hedging Anticipated Commodity Transactions
with Futures—Main Scenario

Journal Entries, 6–30–19X1

Short Futures Contracts[1]	1,764,841	
Other Income[2]	800,422	
Long Futures Contracts[3]		1,862,445
OCI[4]		702,818
(Recognize changes in fair values of futures contracts, and separate into effective and ineffective portions)		
Long Futures Contracts	553,625	
Cash		553,625
(Net cash settle July bean contracts)		

Journal Entries, 7–31–19X1

Inventory	5,632,000	
Cash		5,632,000
(Record purchase of inventory (entry made on July 1))		
Long Futures Contracts[5]	459,768	
OCI[6]	610,860	
Short Futures Contracts[7]		771,431
Other Income[8]		299,197
(Recognize changes in fair values of futures contracts, and separate into effective and ineffective portions)		
Long Futures Contracts[9]	451,913	
Short Futures Contracts[10]		367,128
Cash		84,785
(Net cash settle August bean, oil, and meal contracts)		

Journal Entries, 8–31–19X1

Inventory	5,610,000	
Cash		5,610,000
(Record purchase of inventory (entry made on August 1))		

Journal Entries, 8–31–19X1, (continued)

Cash	6,301,196	
Sales		6,301,196
(Record sales of oil and meal (entry made in early August))		
Cost of Goods Sold	5,632,000	
Inventory		5,632,000
(Record cost of August sales)		
Reclassification Adjustment (OCI)	42,051	
Cost of Goods Sold[11]	276,813	
Sales[12]		318,864
(Reclassify OCI to earnings to match earnings impact of hedged transactions)		
OCI[13]	619,740	
Short Futures Contracts[14]		273,144
Long Futures Contracts[15]		99,836
Other Income[16]		246,760
(Recognize changes in fair values of futures contracts, and separate into effective and ineffective portions)		
Long Futures Contracts[17]	496,975	
Short Futures Contracts[18]		133,664
Cash		363,311
(Net cash settle September bean, oil, and meal contracts)		

Journal Entries, 9–30–19X1

Inventory	4,884,000	
Cash		4,884,000
(Record purchase of inventory (entry made on September 1))		
Cash	6,386,204	
Sales		6,386,204
(Record sales of oil and meal (entry made in early September))		
Cost of Goods Sold	5,610,000	
Inventory		5,610,000
(Record cost of September sales)		

Journal Entries, 9–30–19X1, (continued)

Cost of Goods Sold[19]	292,262	
Sales[20]		260,344
Reclassification Adjustment (OCI)		31,918
(Reclassify OCI to earnings to match earnings impact of hedged transactions)		
Short Futures Contracts[21]	156,634	
Other Income[22]	462,942	
OCI[23]		619,576
(Recognize changes in fair values of futures contracts, and separate into effective and ineffective portions)		
Cash	376,108	
Short Futures Contracts		376,108
(Net cash settle October oil and meal contracts)		

Journal Entries, 10–1–19X1

Cash	5,500,220	
Sales		5,500,220
(Record sales of oil and meal (entry made in early October))		
Cost of Goods Sold	4,884,000	
Inventory		4,884,000
(Record cost of October sales)		
Reclassification Adjustment (OCI)	81,661	
Cost of Goods Sold[24]	796,963	
Sales[25]		878,624
(Reclassify OCI to earnings to match earnings impact of hedged transactions)		

Notes to Journal Entries—Main Scenario

1. Fair values of August, September, and October soybean oil and meal futures.

2. The debit is the net of the "Net Income effect" line for July beans, Dr 276,812; August beans, Dr 429,167; September beans, Dr 330,153; August oil, Dr 1,122; August meal, Cr 162,865; September meal, Cr 135,046; and October meal, Dr 61,079.

3. Fair values of July, August, and September bean contracts.

4. The credit is the net of the "OCI effect" line for July beans, Dr 276,813; August beans, Dr 275,435; September beans, Dr 274,065; August oil, Cr 159,379; September oil, Cr 158,586; October oil, Cr 157,797; August meal, Cr 352,876; September meal, Cr 351,120; and October meal, Cr 349,373.

5. Records the decrease in the fair values of the bean futures: August, Dr 252,689; September, Dr 207,079.

6. The debit is the net of the "OCI effect" line for August beans, Dr 16,827; September beans, Dr 16,743; August oil, Dr 48,835; September oil, Dr 48,592; October oil, Dr 48,350; August meal, Dr 144,556; September meal, Dr 143,836; and October meal, Dr 143,121.

7. Records the decrease in the fair values of the oil and meal futures: August oil, Cr 21,769; September oil, Cr 29,511; October oil, Cr 32,715; August meal, Cr 285,101; September meal, Cr 212,256; and October meal, Cr 190,079.

8. The credit is the net of the "Net Income effect" line for August beans, Cr 269,516; September beans, Cr 223,822; August oil, Cr 27,066; September oil, Cr 19,081; October oil, Cr 15,635; August meal, Dr 140,545; September meal, Dr 68,420; and October meal, Dr 46,958.

9. Record the net cash settlement of the August bean contract.

10. Record the net cash settlement of the August oil contract, Cr 136,488, and the August meal contract, Cr 230,640.

11. See line 11, "OCI Components Schedule."

12. See line 12, "OCI Components Schedule."

13. The debit is the net of the "OCI effect" line for September beans, Dr 506,155; September oil, Dr 22,010; October oil, Dr 21,901; September meal, Dr 34,924; and October meal, Dr 34,750.

14. Record the increase in the value of the October meal contract, Dr 1,725; and the decrease in fair values of September oil, Cr 1,611; October oil, Cr 5,548; and September meal, Cr 267,710.

15. Record the increase in fair value of September beans, Cr 99,836.

16. The credit is the net of the "Net Income effect" line for September beans, Cr 406,319; September oil, Cr 20,399; October oil, Cr 16,353; September meal, Dr 232,786; and October meal, Cr 36,475.

17. Record the net cash settlement of the September bean contract.

18. Record the net cash settlement of the September oil contract, Cr 127,464, and the September meal contract, Cr 6,200.

19. See line 19, "OCI Components Schedule."

20. See line 20, "OCI Components Schedule."

21. Record the increase in the fair value of the October meal contract, Dr 198,900; and the decrease in the fair value of the October oil contract, Cr 42,266.

22. The debit is the net of the "Net Income effect" line for October oil, Cr 2,416; and October meal, Dr 465,358.

23. The credit is the net of the "OCI effect" line for October oil, Dr 44,682; and October meal, Cr 664,258.

24. See line 24, "OCI Components Schedule."

25. See line 25, "OCI Components Schedule."

OCI Components Schedule—Main Scenario

		June	July	August	September	Total
Related to August Sales						
Line 11	July Beans	Dr 276,813				Dr 276,813
Line 12	August Oil	Cr 159,379	Dr 48,835			
	August Meal	Cr 352,876	Dr 144,556			Cr 318,864
Related to September Sales						
Line 19	August Beans	Dr 275,435	Dr 16,827			Dr 292,262
Line 20	September Oil	Cr 158,586	Dr 48,592	Dr 22,010		
	September Meal	Cr 351,120	Dr 143,836	Dr 34,924		Cr 260,344
Related to October Sales						
Line 24	September Beans	Dr 274,065	Dr 16,743	Dr 506,155		Dr 796,963
Line 25	October Oil	Cr 157,797	Dr 48,350	Dr 21,901	Dr 44,682	
	October Meal	Cr 349,373	Dr 143,121	Dr 34,750	Cr 664,258	Cr 878,624

T-Accounts for Futures Contracts and (A)OCI

July Soybeans

		553,625	6/30
6/30	553,625	553,625	Bal.

August Soybeans

7/31	252,689	704,602	6/30
7/31	451,913	451,913	Bal.

September Soybeans

7/31	207,079	604,218	6/30
		99,836	8/31
8/31	496,975	496,975	Bal.

August Oil

6/30	158,257	21,769	7/31
Bal.	136,488	136,488	7/31

September Oil

6/30	158,586	29,511	7/31
		1,611	8/31
Bal.	127,464	127,464	8/31

October Oil

6/30	157,797	32,715	7/31
		5,548	8/31
		42,266	9/30
Bal.	77,268	77,268	9/30

August Meal

6/30	515,741	285,101	7/31
Bal.	230,640	230,640	7/31

September Meal

6/30	486,166	212,256	7/31
		267,710	8/31
Bal.	6,200	6,200	8/31

October Meal

6/30	288,294	190,079	7/31
8/31	1,725		
9/30	198,900		
Bal.	298,840	298,840	9/30

(A)OCI

7/31	610,860	702,818	6/30
8/31*	42,051	31,918	9/30*
8/31	619,740	619,576	9/30
10/31*	81,661		

*Reclassification Adjustments

Schedule of Expected, Actual, and Hedged Results

	August	September	October	Total
Sales, based on April spot prices				
Soybean Oil ($.2426 \times 5,640,000$)	1,368,264	1,368,264	1,368,264	4,104,792
Soybean Meal ($272.8 \times 12,400$)	3,382,720	3,382,720	3,382,720	10,252,952
Total Revenue	4,750,984	4,750,984	4,750,984	14,252,952
COGS, based on April spot prices				
Soybeans ($8.2175 \times 515,000$)	4,232,013	4,232,013	4,232,013	12,696,039
Gross margin, based on April spot prices	518,971	518,971	518,971	1,556,913
Sales (70%), based on actual prices	4,410,837	4,470,343	3,850,154	12,731,334
COGS (70%), based on actual prices	3,942,400	3,927,000	3,418,800	11,288,200
Gross margin (70%), based on actual prices	468,437	543,343	431,354	1,443,134
Hedge effect on sales	318,864	260,344	878,624	1,457,832
Hedge effect on COGS	276,813	292,262	796,963	1,366,038
Hedge effect on Gross margin	42,051	(31,918)	81,661	91,794
Actual gross margin plus effects of hedging	510,488	511,425	513,015	1,534,928

Answer to requirement 5: The hedging strategy is fairly effective as judged by comparing actual plus hedge results to the expected results based on spot prices at the inception of the futures. The percentage difference between total actual plus hedge results and total expected results, using expected results as the base, is $-1.41\%(= \frac{1,534,928-1,556,913}{1,556,913})$. Without hedging, the percentage difference would have been $-7.31\%(= \frac{1,443,134-1,556,913}{1,556,913})$. However, one also needs to consider the $717,407 total decrease in earnings due to the change in the values of the futures that was excluded from determination of hedging effectiveness. It is true that for this three month period, C.L. Smith and Sons would have been better off overall had they not used futures, and simply bought and sold at spot prices. But that would not always be true—sometimes spot prices might change such that they had losses from buying soybeans for high prices and being forced to sell soybean oil and meal for low prices. Effective hedging generally provides *stability* of prices by protecting against the effects of adverse changes in prices, but also by forfeiting the effects of beneficial price changes.

Answer to requirement 6 (optional): There are two reasons the actual plus hedge results don't match the expected results. Both are caused by the standardization of futures, as compared to forwards. The futures were closed out prior to the purchase and sale dates, so differences might exist between the last spot rate used in hedge evaluation and the actual spot rate at the time of purchases and sales. The second difference is related to the standardized quantities specified in futures contracts. C.L. Smith and Sons purchased 103 soybean futures, and sold 94 soybean oil futures and 124 soybean meal futures. These hedged *approximately* 70% of the purchases and sales. However, bushels of soybeans specified in 103 futures *do not* produce exactly the pounds of oil and tons of meal specified in 94 soybean oil futures and 124 soybean meal futures. Approximately 102.7 soybean futures would hedge 70% of the 22,000 tons of beans purchased. Approximately 93.9 soybean oil futures and 123.2 soybean meal futures would be needed to hedge the 4,026 and 17,600 tons of soybean oil and soybean meal sold. But fractional futures cannot be bought and sold. So the

expected gross margins and the actual plus hedge gross margins are calculated with minor discrepancies in the units included in each line item.

Alternative Scenario:

The main scenario assumed C.L. Smith and Sons was located in Toledo, Ohio. Futures contracts specify a limited number of delivery points, so the accounting illustrated in the main scenario is only appropriate for companies hedging commodities for delivery at one of those points. If a company is hedging commodities for delivery at another delivery point, the accounting must take into consideration the fact that spot prices and related futures prices based on a commodity at one location may not move together with spot prices at another location. Therefore, assuming the company designates changes in the value of the futures contracts due to changes in spot rates (at the allowed delivery points) as hedges of the exposure to variability in discounted expected cash flows due to changes in spot prices for anticipated transactions at a different point, there may be ineffectiveness due to differing changes in spot prices at the different locations. It will be necessary to determine, as before, the portion of the changes in value of the futures contracts excluded from determination of effectiveness, but it will also be necessary to determine the ineffectiveness of the designated hedging relation. That is, the portion of the change in value of the of the futures contract due to changes in spot prices at a delivery point identified in the futures contract must be divided into the portion *effective* at hedging changes in discounted expected cash flows at the actual delivery point, and the *ineffective* portion. Only the effective portion will be recognized in OCI; the portion excluded from determination of effectiveness and the ineffective portion will be reflected in net income in the period of the change.

Statement 133, paragraphs 140–143, presents a framework to methodically determine the effective and ineffective portions of the change in value of the futures due to changes in spot prices at a delivery point identified by the futures contract. A table with the following layout can be used.

	FV of Fut. Contracts Due to Changes in Spot Prices at Delivery Points Identified in Fut. Contract Increase (Decrease)		Present Value of Expected Future Cash Flows on Hedged Transaction Due to Changes in Spot Prices at Local Delivery Point Increase (Decrease)		Lesser of the Two Cumulative Changes	Entry to OCI
Contract and Period End	Change During Period	Cumulative Change	Change During Period	Cumulative Change	(AOCI Bal.)	Dr (Cr)
	(1)	(2)	(3)	(4)	(5)	(6)
October Soy Meal						
June 30						
July 31						
August 31						
September 30						

Column (1) lists, period by period, changes in the portion of the fair value of the futures that are due to changes in spot prices at the futures delivery location. That is, the fair value changes in this column are the changes designated by the company as being potentially effective hedges. It does not include the portion of fair value changes excluded from determination of effectiveness. Column (2) lists cumulative changes; these are the maximum possible amounts that could affect OCI. It is, however, possible that changes in the discounted expected cash flows of the hedged anticipated transactions are less than the changes in the designated portions of the hedging instruments. Cumulative changes in the hedged items limit the amount of derivative gain or loss that may be included in OCI. Column (3) lists periodic changes in discounted expected cash flows of the hedged

transactions. Column (4) lists the corresponding cumulative change. Column (5) contains the smaller in absolute value of columns (2) and (4), and is conceptually the smaller of the cumulative change in the hedging derivative and the hedged item. It is the cumulative effective gain or loss on the hedging derivative that should be reflected in OCI at the end of each period. (In the spreadsheet printout accompanying this case, the convention followed is to give column (5) the opposite sign as column (2); that is, a debit in column (2), indicating a cumulative increase in the value of the derivative, is matched by a credit in column (5), the balance in accumulated OCI.) Column (6) is the difference between the current and preceding rows of column (5). Conceptually, it is the adjustment that should be made to OCI in the journal entry marking the futures contracts to fair value. The entry will be balanced, if necessary, with an adjustment to net income.

Assume the same material as in the main scenario, except now assume that Mr. Smith, an avid NASCAR fan, chose to locate C.L. Smith and Sons in Atlanta, Georgia, to be closer to the sport he loves. One of the costs of this decision is that, although he can still use soybean futures for hedging purposes, he will have to determine ineffectiveness of the hedges due to differences between the spot prices for Toledo delivery, and those in Atlanta. Assume the following schedule of Atlanta spot prices.

	Soybeans	Soybean Oil	Soybean Meal
4–1–19X1	819.5	.24	274
6–30–19X1	772	.213	244
7–31–19X1	767	.22	254.5
8–31–19X1	671	.222	256.9
9–30–19X1		.228	202.4

Required: Prepare only those journal entries that (1) mark the futures to fair value, with appropriate division of the total changes between net income and OCI and (2) that accomplish the reclassification of OCI to net income when the hedged transactions affect net income.

	A	B	C	D	E
149	PV of Expected Cash Flows on Hedged Transactions				
150					
151	Soybeans				
152	Units in contract	5000			
153	Contracts	103			
154	Total quantity	515000			
155			July	August	September
156					
157	Original Spot Price		8.195	8.195	8.195
158	Month to Exp at 6/30		0	1	2
159					
160	June 30				
162	Spot price		7.72	7.72	7.72
163	Months from Jun30		0	0	0
165	FVd(spot)		244625	243408	242197
168	dFVd(spot)		244,625	243,408	242,197
170					
171	July 31				
173	Spot price			7.67	7.67
174	Months from Jun30			1	1
176	FVd(spot)			270375	269030
179	dFVd(spot)			26,967	26,833
181					
182	August 31				
184	Spot price				6.71
185	Months from Jun30				2
187	FVd(spot)				764775
190	dFVd(spot)				495,745
191					

	A	B	C	D	E
192	Soybean Oil				
193	Units in contract	60000			
194	Contracts	94			
195	Total quantity	5640000			
196			August	September	October
197					
198	Original Spot Price		0.24	0.24	0.24
199	Month to Exp at 6/30		1	2	3
200					
201	June 30				
203	Spot price		0.213	0.213	0.213
204	Months from Jun30		0	0	0
206	FVd(spot)		-151522	-150769	-150018
209	dFVd(spot)		(151,522)	(150,769)	(150,018)
211					
212	July 31				
214	Spot price		0.22	0.22	0.22
215	Months from Jun30		1	1	1
217	FVd(spot)		-112800	-112239	-111680
220	dFVd(spot)		38,722	38,530	38,338
222					
223	August 31				
225	Spot price			0.222	0.222
226	Months from Jun30			2	2
228	FVd(spot)			-101520	-101015
231	dFVd(spot)			10,719	10,665
233					
234	September 30				
236	Spot price				0.228
237	Months from Jun30				3
239	FVd(spot)				-67680
242	dFVd(spot)				33,335
243					

	A	B	C	D	E
244	Soybean Meal				
245	Units in contract	100			
246	Contracts	124			
247	Total quantity	12400			
248			August	September	October
249					
250	Original Spot Price		274	274	274
251	Month to Exp at 6/30		1	2	3
252					
253	June 30				
255	Spot price		244	244	244
256	Months from Jun30		0	0	0
258	FVd(spot)		-370149	-368308	-366475
261	dFVd(spot)		(370,149)	(368,308)	(366,475)
263					
264	July 31				
266	Spot price		254.5	254.5	254.5
267	Months from Jun30		1	1	1
269	FVd(spot)		-241800	-240597	-239400
272	dFVd(spot)		128,349	127,711	127,075
274					
275	August 31				
277	Spot price			256.9	256.9
278	Months from Jun30			2	2
280	FVd(spot)			-212040	-210985
283	dFVd(spot)			28,557	28,415
285					
286	September 30				
288	Spot price				202.4
289	Months from Jun30				3
291	FVd(spot)				-887840
294	dFVd(spot)				(676,855)

	I	J	K	L	M	N	O
297	Calculation of OCI Entry						
298							
299				Present Value of			
300				Expected Future			
301				Cash Flows on			
302		FV of Derivative		Hedged Transaction			
303		Increase (Decrease)		Increase (Decrease)		Lesser of	
304						the Two	
305		Change		Change		Cumulative	Entry to
306		During	Cumulative	During	Cumulative	Changes	OCI
307	Contract and Period End	Period	Change	Period	Change	(AOCI Bal.)	Dr (Cr)
308	July Soybeans						
309	June 30	(276,813)	(276,813)	244,625	244,625	244,625	244,625
310							
311	August Soybeans						
312	June 30	(275,435)	(275,435)	243,408	243,408	243,408	243,408
313	July 31	(16,827)	(292,262)	26,967	270,375	270,375	26,967
314							
315	September Soybeans						
316	June 30	(274,065)	(274,065)	242,197	242,197	242,197	242,197
317	July 31	(16,743)	(290,808)	26,833	269,030	269,030	26,833
318	August 31	(506,155)	(796,963)	495,745	764,775	764,775	495,745
319							
320	August Soy Oil						
321	June 30	159,379	159,379	(151,522)	(151,522)	(151,522)	(151,522)
322	July 31	(48,835)	110,544	38,722	(112,800)	(110,544)	40,978
323							
324	September Soy Oil						
325	June 30	158,586	158,586	(150,769)	(150,769)	(150,769)	(150,769)
326	July 31	(48,592)	109,994	38,530	(112,239)	(109,994)	40,775
327	August 31	(22,010)	87,984	10,719	(101,520)	(87,984)	22,010
328							
329	October Soy Oil						
330	June 30	157,797	157,797	(150,018)	(150,018)	(150,018)	(150,018)
331	July 31	(48,350)	109,447	38,338	(111,680)	(109,447)	40,571
332	August 31	(21,901)	87,546	10,665	(101,015)	(87,546)	21,901
333	September 30	(44,682)	42,864	33,335	(67,680)	(42,864)	44,682
334							
335	August Soy Meal						
336	June 30	352,876	352,876	(370,149)	(370,149)	(352,876)	(352,876)
337	July 31	(144,556)	208,320	128,349	(241,800)	(208,320)	144,556
338							
339	September Soy Meal						
340	June 30	351,120	351,120	(368,308)	(368,308)	(351,120)	(351,120)
341	July 31	(143,836)	207,284	127,711	(240,597)	(207,284)	143,836
342	August 31	(34,924)	172,360	28,557	(212,040)	(172,360)	34,924
343							
344	October Soy Meal						
345	June 30	349,373	349,373	(366,475)	(366,475)	(349,373)	(349,373)
346	July 31	(143,121)	206,252	127,075	(239,400)	(206,252)	143,121
347	August 31	(34,750)	171,502	28,415	(210,985)	(171,502)	34,750
348	September 30	664,258	835,760	(676,855)	(887,840)	(835,760)	(664,258)

Hedging Anticipated Commodity Transactions
with Futures—Alternative Scenario

Journal Entries, 6–30–19X1

Short Futures Contracts[1]	1,764,841	
Other Income[2]	873,052	
Long Futures Contracts		1,862,445
OCI[3]		775,448
(Recognize changes in fair values of futures contracts, and separate into effective and ineffective portions)		

Journal Entries, 7–31–19X1

Long Futures Contracts	459,768	
OCI[4]	607,637	
Short Futures Contracts		771,431
Other Income		295,974
(Recognize changes in fair values of futures contracts, and separate into effective and ineffective portions)		

Journal Entries, 8–31–19X1

Reclassification Adjustment (OCI)	74,238	
Cost of Goods Sold[5]	244,625	
Sales[6]		318,863
(Reclassify OCI to earnings to match earnings impact of hedged transactions)		
OCI[7]	609,330	
Short Futures Contracts		273,144
Long Futures Contracts		99,836
Other Income		236,350
(Recognize changes in fair values of futures contracts, and separate into effective and ineffective portions)		

Journal Entries, 9–30–19X1

Cost of Goods Sold[8]	270,375	
Sales[9]		260,344
Reclassification Adjustment (OCI)		10,031
(Reclassify OCI to earnings to match earnings impact of hedged transactions)		

Journal Entries, 10–1–19X1

Reclassification Adjustment (OCI)	113,849	
Cost of Goods Sold[10]	764,775	
Sales[11]		878,624
(Reclassify OCI to earnings to match earnings impact of hedged transactions)		

Notes to Journal Entries—Alternative Scenario

1. All "Futures Contracts" entries are the same as those in the main scenario, because the values of the futures contracts are based on changes in the futures prices, which do not change between the main and alternative scenarios. Only the effective portion of the changes in spot prices related to the futures contracts changes between scenarios.

2. "Other Income" amounts balance the journal entries. Conceptually, they comprise (a) amounts excluded from determination of effectiveness and (b) the ineffective portions of changes in the fair values of the futures due to changes in spot prices. The ineffectiveness is due to different spot prices at the delivery locations identified in futures contracts, and spot prices in Atlanta.

3. The credit is the net of the "June 30" lines in the "Entry to OCI" column of the "Calculation of OCI Entry" spreadsheet printout. It consists of July beans, Dr 244,625; August beans, Dr 243,408; September beans, Dr 242,408; August oil, Cr 151,522; September oil, Cr 150,769; October oil, Cr 150,018; August meal, Cr 352,876; September meal, Cr 351,120; and October meal, Cr 349,373.

4. The debit is the net of the "July 31" lines in the "Entry to OCI" column of the "Calculation of OCI Entry" spreadsheet printout. It consists of August beans, Dr 26,967; September beans, Dr 26,833; August oil, Dr 40,978; September oil, Dr 40,775; October oil, Dr 40,571; August meal, Dr 144,556; September meal, Dr 143,836; and October meal, Dr 143,121.

5. See line 5, "OCI Components Schedule."

6. See line 6, "OCI Components Schedule."

7. The debit is the net of the "August 31" lines in the "Entry to OCI" column of the "Calculation of OCI Entry" spreadsheet printout. It consists of September beans, Dr 495,745; September oil, Dr 22,010; October oil, Dr 21,901; September meal, Dr 34,924; and October meal, Dr 34,750.

8. See line 8, "OCI Components Schedule."

9. See line 9, "OCI Components Schedule."

10. See line 10, "OCI Components Schedule."

11. See line 11, "OCI Components Schedule."

OCI Components Schedule—Alternative Scenario

		June	July	August	September	Total
Related to August Sales						
Line 5	July Beans	Dr 244,625				Dr 244,625
Line 6	August Oil	Cr 151,522	Dr 40,978			
	August Meal	Cr 352,875	Dr 144,556			Cr 318,863
Related to September Sales						
Line 8	August Beans	Dr 243,408	Dr 26,967			Dr 270,375
Line 9	September Oil	Cr 150,769	Dr 40,775	Dr 22,010		
	September Meal	Cr 351,120	Dr 143,836	Dr 34,924		Cr 260,344
Related to October Sales						
Line 10	September Beans	Dr 274,197	Dr 26,833	Dr 495,745		Dr 764,775
Line 11	October Oil	Cr 150,018	Dr 40,571	Dr 21,901	Dr 44,682	
	October Meal	Cr 349,373	Dr 143,121	Dr 34,750	Cr 664,258	Cr 878,624

C.L. Smith and Sons: Accounting for Futures
Hedging Commodity Purchases and Sales
—Lite Version—

Walter R. Teets Robert Uhl

C.L. Smith and Sons: Accounting for Futures Hedging
Commodity Purchases and Sales—Lite Version

Walter R. Teets and Robert Uhl

Main Scenario:

C.L. Smith and Sons, based in Toledo, Ohio, processes soybeans into soybean oil and soybean meal. During the past year, Smith and Sons was hurt by fluctuating bean, oil, and meal prices, and would like to lock in the crush margin[25] to avoid a repetition of the problem. Mr. Smith, the manager and owner, took a class recently through the state university's extension program about using futures to insulate businesses from fluctuations in prices of various commodities. Entering into August futures for purchase of soybeans (referred to as a long position) would allow him to lock in the purchase price for soybeans. Also, he could enter into September futures for sales of soybean oil and soybean meal (referred to as short positions), to lock in finished product prices. The Smith and Sons processing plant can crush 1,000 tons of beans per day, resulting in approximately 183 tons of soybean oil and 800 tons of soybean meal.

Assume that on April 1, 19X1 Mr. Smith takes long positions in August soybean futures[26], entering into enough contracts to hedge approximately 70% of the plant's expected monthly production requirements (assume 22 days per month and 60 pounds of soybeans per bushel). He also takes short positions in September soybean oil and soybean meal positions, again entering into enough contracts to cover 70% of the oil and meal expected to be produced during the month. Assume that Mr. Smith net cash settles[27] the relevant futures positions on the last trading day of the month prior to the month the futures contracts mature. That is, he settles the August soybeans contracts by paying or receiving in cash the fair value of the contracts in cash on the last business day of July. In that way, he does not risk having to take physical delivery of the soybeans under the futures contract; instead, he will buy soybeans from a local farmer at the prevailing cash price. Similarly, he net cash settles the soybean oil and meal contracts prior to the delivery month, to avoid potential problems associated with thin markets. Assume the contract prices are set at inception at the prevailing forward prices for the relevant maturities, so there is no cost April 1 to enter into the futures (ignore margin requirements). Finally, assume Mr. Smith designates the changes in value of the futures due to changes in spot prices as cash flow hedges of the anticipated purchases of soybeans, and anticipated sales of soybean oil and soybean meal.[28] Changes in value of the futures due to changes in the difference between the spot price and the futures price will be reflected immediately in income.

[25]The crush margin is the difference between the cost of a bushel of soybeans and the combined revenue from the soybean oil and meal produced from a bushel of soybeans. For additional institutional detail related to soybeans and related products, see *Soy Importers' Handbook* at http://www.pacweb.net.sg/asa/technical/soy.html.

[26]Appendix A provides information on various futures contracts, as well as prices needed to complete requirements of this case.

[27]The actual settlement method for futures involves entering into offsetting futures contracts which are netted by the futures exchange at the end of the day. Bringing this additional institutional detail into the solution of the case would not add significantly to understanding of the accounting for futures contracts.

[28]Assume the anticipated purchases and sales meet all requirements necessary to be designated as the hedged items.

Required:

1. Prepare a summary journal entry to show the effects of April, May, and June price changes on the futures contracts. Show calculations in good form. Assume the appropriate interest rate to be used in determining the fair values of the futures contracts is 0.5% per month. Also assume Smith and Sons follows the practice of accounting for long futures positions in the "Long Futures Contracts" account, and short positions in the "Short Futures Contracts" account.

2. Prepare all journal entries related to soybeans, soybean oil, and soybean meal hedging, and purchase and sales activity, for July, August, September, and October, assuming the following schedule of purchases and sales. Ignore any additional production costs.

Purchase and Sale Data

	August	September
Tons of soybeans purchased	22,000	
Price per ton	$255	
Tons of soybean oil sold		4,026
Price per ton		$454
Tons of soybean meal sold		17,600
Price per ton		$259

3. Prepare a schedule computing the expected gross margin based on spot prices of April 1, when the futures contracts were initiated. Base this schedule on the units hedged with the futures contracts. Next, prepare a schedule of actual gross margin achieved, based on actual prices. Since only 70% of purchases and sales were hedged with futures, prepare this schedule based on only 70% of actual purchases and sales made. Third, prepare a schedule showing the effects of the hedging strategy (effective part only) on the gross margin. Finally, determine the actual gross margin plus the effects of hedging. Use the format on the following page.

	September
Sales, based on April spot prices	
Soybean Oil	
Soybean Meal	
Total Revenue	
COGS, based on April spot prices	
Soybeans	
Gross margin, based on April spot prices	
Sales (70%), based on actual prices	
COGS (70%), based on actual prices	
Gross margin (70%), based on actual prices	
Hedge effect on sales	
Hedge effect on COGS	
Hedge effect on Gross margin	
Actual gross margin plus effects of hedging	

4. Discuss briefly the effectiveness of the hedging strategy (do not attempt to determine why the actual gross margin plus effect of hedge does not match the expected gross margin). Did C.L. Smith and Sons benefit overall, or would they have been better off not hedging?

5. *Optional:* Why does the actual gross margin plus effect of hedge not exactly match the expected gross margin?

Appendix A

Futures Symbols

BO	Soybean Oil
S	Soybeans
SM	Soybean Meal

Contract Specifications

Commodity Type (Symbol)	Soybeans (S)	Soybean Oil (BO)	Soybean Meal (SM)
Exchange Name	CBT[1]	CBT	CBT
Delivery Months	F,H,K,N,Q,U,X	F,H,K,N,Q,U,V,Z	F,H,K,N,Q,U,V,Z
Contract Unit	5,000 bu.	60,000 lbs.	100 tons
Price Quoted In	¢/bu.	¢/lb.	$/ton
Minimum Fluctuation	$.0025/bu.	$.0001/lb.	$.10/ton
$ Value of Minimum Tick	12.50	6.00	10.00
$ VALUE OF 1¢ Move	50	600	1
First Delivery Day	1st business day	1st business day	1st business day

[1]Chicago Board of Trade

Key to Contract Months

1st Year	Month	2nd Year	1st Year	Month	2nd Year	1st Year	Month	2nd Year
F	January	A	K	May	E	U	September	P
G	February	B	M	June	F	V	October	R
H	March	C	N	July	L	X	November	S
J	April	D	Q	August	O	Z	December	T

Relevant Spot and Futures Prices

Symbol	Date	Spot Price	Contract	Futures Price
BO	04/01/19X1	24.26	U19X1	24.86
S		821.75	Q19X1	855.75
SM		272.8	U19X1	256
BO	04/30/19X1	24.9	U19X1	25.68
S		880.25	Q19X1	860.25
SM		289.9	U19X1	255.9
BO	05/31/19X1	23.51	U19X1	24.12
S		864.75	Q19X1	830.75
SM		304.5	U19X1	247.7
BO	06/30/19X1	21.42	U19X1	22.02
S		768	Q19X1	718.25
SM		244.2	U19X1	216.4

Relevant Spot and Futures Prices (continued)

Symbol	Date	Spot Price	Contract	Futures Price
BO	07/31/19X1	22.3	U19X1	22.56
S		765	Q19X1	768
SM		256	U19X1	233.8
BO	08/31/19X1	22.7	U19X1	22.6
SM		258.9	V19X1	221.4

	A	B	D	G
1	Periodic interest rate (a)	0.50%		
2				
3	Soybeans			
4	Units in contract (b)	5000		
5	Contracts (c)	103		
6	Total quantity (d)	515000		
7			August	
8	Future Contract Price		8.5575	
9	Original Spot Price		8.2175	
10	Month to Exp at 6/30 (e)		1	
11				
12	June 30			
13	Future price		7.1825	
14	Spot price		7.68	
15	Months from Jun30 (f)		0	
16	FVd(fut) (g)		-704602	
17	FVd(spot) (h)		-275435	
18	FVd(fut-spot) (i)		-429167	
19	dFVd(fut) (j)		(704,602)	(FC Asset/liab effect)
20	dFVd(spot) (j)		275,435	(OCI effect)
21	dFVd(fut-spot) (j)		429,167	(Net Income effect)
22				
23	July 31			
24	Future price		7.68	
25	Spot price		7.65	
26	Months from Jun30		1	
27	FVd(fut)		-451913	
28	FVd(spot)		-292262	
29	FVd(fut-spot)		-159651	
30	dFVd(fut) (k)		252,689	(FC Asset/liab effect)
31	dFVd(spot) (k)		16,827	(OCI effect)
32	dFVd(fut-spot) (k)		(269,516)	(Net Income effect)
33				

	A	B	D	G
44	Soybean Oil			
45	Units in contract	60000		
46	Contracts	94		
47	Total quantity	5640000		
48			September	
49	Future Contract Price		0.2486	
50	Original Spot Price		0.2426	
51	Month to Exp at 6/30 (e)		2	
52				
53	June 30			
54	Future price		0.2202	
55	Spot price		0.2142	
56	Months from Jun30 (f)		0	
57	FVd(fut) (l)		158586	
58	FVd(spot) (m)		158586	
59	FVd(fut-spot) (n)		0	
60	dFVd(fut)		158,586	(FC Asset/liab effect)
61	dFVd(spot)		(158,586)	(OCI effect)
62	dFVd(fut-spot)		-	(Net Income effect)
63				
64	July 31			
65	Future price		0.2256	
66	Spot price		0.223	
67	Months from Jun30		1	
68	FVd(fut)		129075	
69	FVd(spot)		109994	
70	FVd(fut-spot)		19081	
71	dFVd(fut)		(29,511)	(FC Asset/liab effect)
72	dFVd(spot)		48,592	(OCI effect)
73	dFVd(fut-spot)		(19,081)	(Net Income effect)
74				
75	August 31			
76	Future price		0.226	
77	Spot price		0.227	
78	Months from Jun30		2	
79	FVd(fut)		127464	
80	FVd(spot)		87984	
81	FVd(fut-spot)		39480	
82	dFVd(fut)		(1,611)	(FC Asset/liab effect)
83	dFVd(spot)		22,010	(OCI effect)
84	dFVd(fut-spot)		(20,399)	(Net Income effect)
85				

	A	B	D	G
96	Soybean Meal			
97	Units in contract	100		
98	Contracts	124		
99	Total quantity	12400		
100			September	
101	Future Contract Price		256	
102	Original Spot Price		272.8	
103	Month to Exp at 6/30 (e)		2	
104				
105	June 30			
106	Future price		216.4	
107	Spot price		244.2	
108	Months from Jun30 (f)		0	
109	FVd(fut) (l)		486166	
110	FVd(spot) (m)		351120	
111	FVd(fut-spot) (n)		135046	
112	dFVd(fut)		486,166	(FC Asset/liab effect)
113	dFVd(spot)		(351,120)	(OCI effect)
114	dFVd(fut-spot)		(135,046)	(Net Income effect)
115				
116	July 31			
117	Future price		233.8	
118	Spot price		256	
119	Months from Jun30		1	
120	FVd(fut)		273910	
121	FVd(spot)		207284	
122	FVd(fut-spot)		66626	
123	dFVd(fut)		(212,256)	(FC Asset/liab effect)
124	dFVd(spot)		143,836	(OCI effect)
125	dFVd(fut-spot)		68,420	(Net Income effect)
126				
127	August 31			
128	Future price		255.5	
129	Spot price		258.9	
130	Months from Jun30		2	
131	FVd(fut)		6200	
132	FVd(spot)		172360	
133	FVd(fut-spot)		-166160	
134	dFVd(fut)		(267,710)	(FC Asset/liab effect)
135	dFVd(spot)		34,924	(OCI effect)
136	dFVd(fut-spot)		232,786	(Net Income effect)

Notes to Spreadsheet Calculating Fair Values
and Changes in Fair Values

These notes contain (1) a description of the values in the rows associated with the note, and in some cases, (2) the formula used to calculate the value shown in the cell to which the first occurrence of the note is related.

(a) The periodic interest rate is used to discount expected cash flows to determine fair values of the futures. It is assumed to be 6% per year, or .5% per month.

(b) Futures prices are quoted in different units. Soybeans are quoted in cents per bushel, soybean oil is quoted in cents per pound, and soybean meal is quoted in dollars per ton. This cell, and the following two cells, are used to determine how many units in total of soybeans, soybean oil, and soybean meal are involved under the futures contracts each month. For soybeans, there are 5,000 bushels in a contract; for soybean oil, 60,000 pounds; and for soybean meal, 100 tons.

(c) Contracts entered into per hedging month are determined by taking the number of tons of input or output per day of each commodity listed in the text, converting to monthly requirements by multiplying by 22 days per month, converting that to the appropriate contract units (bushels, pounds, or tons), dividing that by the number of units per contract, and multiplying by .7, since Smith and Sons is hedging only 70% of purchase and sales requirements.

B5: $= \text{ROUNDUP}(((1000\frac{\text{tons}}{\text{day}} * 2000\frac{\text{pounds}}{\text{ton}} * 22\frac{\text{days}}{\text{month}})/(60\frac{\text{pounds}}{\text{bushel}} * 5000\frac{\text{bushels}}{\text{contract}})) \times .7, 0)$

B46: $= \text{ROUNDUP}(((183\frac{\text{tons}}{\text{day}} * 2000\frac{\text{pounds}}{\text{ton}} * 22\frac{\text{days}}{\text{month}})/60000\frac{\text{pounds}}{\text{contract}}) \times .7, 0)$

B98: $= \text{ROUNDUP}(((800\frac{\text{tons}}{\text{day}} * 22\frac{\text{days}}{\text{month}})/100\frac{\text{tons}}{\text{contract}}) \times .7, 0)$

(d) The total quantity of units (bushels, pounds, or tons) hedged per month. Changes in futures or spot prices are multiplied by these quantities to determine the undiscounted value of futures contracts due to price changes.

(e) Months to maturity of the contract at June 30, the first date for which calculations/journal entries are required. In conjunction with the number described in note f, this is used to determine how many periods cash flows should be discounted. The assumption used in this case is that August futures effectively mature at the end of July, since holding them past that point could result in Smith having to take physical delivery of the beans, or could result in liquidity problems, in the case of the soybean oil and meal.

(f) Specifies how many months the calculation date is from June 30, the first date for which calculations/journal entries are required. In conjunction with the number described in note e, it is used to determine how many periods cash flows should be discounted. See note e for additional assumptions.

(g) Calculation of the fair value of the futures contracts due to a change between the price specified in the futures contracts, and the current futures price. The change in futures prices is multiplied by the total units under contract, then discounted for

the appropriate time period. Smith and Sons is long soybeans, so if futures prices go down, the futures are a liability. They are short soybean oil and soybean meal, so if futures prices decline, the futures are assets. This explains the leading minus sign in the formula for soybeans.

$$\textbf{D16:}\ = \text{ROUND}(-((\ \underbrace{(D8 - D13)}_{\substack{\text{Difference between}\\ \text{original and current}\\ \text{futures prices}}}\ *\ \overbrace{B6}^{\substack{\text{Total}\\ \text{units}}}\ )/(\underbrace{(1 + B1)}_{\substack{\text{Discount}\\ \text{factor}}}\ \hat{}\ \overbrace{(D10 - D15)}^{\substack{\text{Number of per-}\\ \text{iods to discount}}}\ )), 0)$$

(h) Calculation of the portion of the fair value of the futures contracts due to a change between the spot price at the time the future was entered into, and the current spot price. The change in spot prices is multiplied by the total units under contract, then discounted for the appropriate time period. Changes in this amount are designated by Smith and Sons as hedging variability in cash flows of the anticipated transactions, measured by discounted changes in the spot prices.

$$\textbf{D17:}\ = \text{ROUND}(-((\ \underbrace{(D9 - D14)}_{\substack{\text{Difference between}\\ \text{original and current}\\ \text{spot prices}}}\ *\ \overbrace{B6}^{\substack{\text{Total}\\ \text{units}}}\ )/(\underbrace{(1 + B1)}_{\substack{\text{Discount}\\ \text{factor}}}\ \hat{}\ \overbrace{(D10 - D15)}^{\substack{\text{Number of per-}\\ \text{iods to discount}}}\ )), 0)$$

(i) The portion of the fair value of the futures due to a change in the difference between the futures and spot prices at inception of the futures, and the current futures and spot prices. This portion is effectively the difference between the fair value due to a change in futures prices (see note g) and the portion of the fair value due to a change in spot prices (see note h). Any change in the relation between futures and spot price will not be effective in hedging changes in cash flows of the anticipated transaction, measured by discounted changes in spot prices. Changes in these values are reflected immediately in net income.

(j) Since the futures had zero fair value at inception, at this first measurement date, the changes in fair values are equal to the entire fair values described in notes g, h, and i.

(k) In periods subsequent to the first measurement date of the fair values of the futures and their components, the changes in values are simply the current fair values less the preceding month's fair values.

(l) Smith and Sons is short soybean oil and soybean meal. This explains the leading minus sign in cell D16 that is missing in cells D57 and D109. See note g for additional details relating to this amount.

(m) See notes h and l.

(n) See notes i and l.

Hedging Anticipated Commodity Transactions
with Futures—Main Scenario

Journal Entries, 6–30–19X1

Short Futures Contracts[1]	644,752	
Other Income[2]	294,121	
Long Futures Contracts[3]		704,602
OCI[4]		234,271
(Recognize changes in fair values of futures contracts, and separate into effective and ineffective portions)		

Journal Entries, 7–31–19X1

Long Futures Contracts[5]	252,689	
OCI[6]	209,255	
Short Futures Contracts[7]		241,767
Other Income[8]		220,177
(Recognize changes in fair values of futures contracts, and separate into effective and ineffective portions)		
Long Futures Contracts	451,913	
Cash		451,913
(Net cash settle August bean contracts)		

Journal Entries, 8–31–19X1

Inventory	5,610,000	
Cash		5,610,000
(Record purchase of inventory (entry made on August 1))		
OCI[9]	56,934	
Other Income[10]	212,387	
Short Futures Contracts[11]		269,321
(Recognize changes in fair values of futures contracts, and separate into effective and ineffective portions)		
Cash	133,664	
Short Futures Contracts[12]		133,664
(Net cash settle September oil, and meal contracts)		

Journal Entries, 9–30–19X1

Cash	6,386,204	
Sales		6,386,204
(Record sales of oil and meal (entry made in early September))		
Cost of Goods Sold	5,610,000	
Inventory		5,610,000
(Record cost of September sales)		
Cost of Goods Sold[13]	292,262	
Sales[14]		260,344
Reclassification Adjustment (OCI)		31,918
(Reclassify OCI to earnings to match earnings impact of hedged transactions)		

August Soybeans

7/31	269,516	704,602	6/30
7/31	451,913	451,913	Bal.

September Oil

6/30	158,586	29,511	7/31
		1,611	8/31
Bal.	127,464	127,464	8/31

September Meal

6/30	486,166	212,256	7/31
		267,710	8/31
Bal.	6,200	6,200	8/31

(A)OCI

7/31	209,255	234,271	6/30
8/31	56,934	31,918	9/30*

*Reclassification Adjustments

Notes to Journal Entries—Main Scenario

1. Fair values of September soybean oil and meal futures.
2. The debit is the net of the "Net Income effect" line for August beans, Dr 429,167; and September meal, Cr 135,046.
3. Fair value of August bean contracts.
4. The credit is the net of the "OCI effect" line for August beans, Dr 275,435; September oil, Cr 158,586; and September meal, Cr 351,120.
5. Records the decrease in the fair values of the August bean futures.
6. The debit is the net of the "OCI effect" line for August beans, Dr 16,827; September oil, Dr 48,592; and September meal, Dr 143,836.
7. Records the decrease in the fair values of the oil and meal futures: September oil, Cr 29,511 and September meal, Cr 212,256.
8. The credit is the net of the "Net Income effect" line for August beans, Cr 269,516; September oil, Cr 19,081; and September meal, Dr 68,420.
9. The debit is the net of the "OCI effect" line for September oil, Dr 22,010; and September meal, Dr 34,924.
10. The debit is the net of the "Net Income effect" line for September oil, Cr 20,399; and September meal, Dr 232,786.
11. Record the decrease in fair values of September oil, Cr 1,611; and September meal, Cr 267,710.
12. Record the net cash settlement of the September oil contract, Cr 127,464, and the September meal contract, Cr 6,200.
13. See line 13, "OCI Components Schedule."
14. See line 14, "OCI Components Schedule."

OCI Components Schedule—Main Scenario

		June	July	August	Total
Related to September Sales					
Line 13	August Beans	Dr 275,435	Dr 16,827		Dr 292,262
Line 14	September Oil	Cr 158,586	Dr 48,592	Dr 22,010	
	September Meal	Cr 351,120	Dr 143,836	Dr 34,924	Cr 260,344

Schedule of Expected, Actual, and Hedged Results

	September
Sales, based on April spot prices	
Soybean Oil ($.2426 \times 5,640,000$)	1,368,264
Soybean Meal ($272.8 \times 12,400$)	3,382,720
Total Revenue	4,750,984
COGS, based on April spot prices	
Soybeans ($8.2175 \times 515,000$)	4,232,013
Gross margin, based on April spot prices	518,971
Sales (70%), based on actual prices	4,470,343
COGS (70%), based on actual prices	3,927,000
Gross margin (70%), based on actual prices	543,343
Hedge effect on sales	260,344
Hedge effect on COGS	292,262
Hedge effect on Gross margin	(31,918)
Actual gross margin plus effects of hedging	511,425

Answer to requirement 4: The hedging strategy is fairly effective as judged by comparing actual plus hedge results to the expected results based on spot prices at the inception of the futures. The percentage difference between actual plus hedge results and expected results, using expected results as the base, is $-1.45\%(= \frac{511,425-518,971}{518,971})$. Without hedging, the percentage difference would have been $4.70\%(= \frac{543,343-518,971}{518,971})$. Their hedging activity kept the hedged gross margin close to the expected margin at original spot prices, although the actual gross margin would have been higher. But that would not always be true—sometimes spot prices would change such that the actual margin was lower than the expected margin. Effective hedging generally provides *stability* of prices by protecting against the effects of adverse changes in prices, but also by forfeiting the effects of beneficial price changes. However, one also needs to consider the $138,443 total increase in earnings due to the change in the values of the futures that was excluded from determination of hedging effectiveness. C.L. Smith and Sons benefited overall from their use of futures. But that would also not always be true—results depend on the final relationship between beginning and ending futures and spot prices.

Answer to requirement 5 (optional): There are two reasons the actual plus hedge results don't match the expected results. Both are caused by the standardization of futures, as compared to forwards. The futures were closed out prior to the purchase and sale dates, so differences might exist between the last spot rate used in hedge evaluation and the actual spot rate at the time of purchases and sales. The second difference is related to the standardized quantities specified in futures contracts. C.L. Smith and Sons purchased 103 soybean futures, and sold 94 soybean oil futures and 124 soybean meal futures. These hedged *approximately* 70% of the purchases and sales. However, bushels of soybeans specified in 103 futures *do not* produce exactly the pounds of oil and tons of meal specified in 94 soybean oil futures and 124 soybean meal futures. Approximately 102.7 soybean futures would hedge

70% of the 22,000 tons of beans purchased. Approximately 93.9 soybean oil futures and 123.2 soybean meal futures would be needed to hedge the 4,026 and 17,600 tons of soybean oil and soybean meal sold. But fractional futures cannot be bought and sold. So the expected gross margins and the actual plus hedge gross margins are calculated with minor discrepancies in the units included in each line item.

Alternative Scenario:

The main scenario assumed C.L. Smith and Sons was located in Toledo, Ohio. Futures contracts specify a limited number of delivery points, so the accounting illustrated in the main scenario is only appropriate for companies hedging commodities for delivery at one of those points. If a company is hedging commodities for delivery at another delivery point, the accounting must take into consideration the fact that spot prices and related futures prices based on a commodity at one location may not move together with spot prices at another location. Therefore, assuming the company designates changes in the value of the futures contracts due to changes in spot rates (at the allowed delivery points) as hedges of the exposure to variability in discounted expected cash flows due to changes in spot prices for anticipated transactions at a different point, there may be ineffectiveness due to differing changes in spot prices at the different locations. It will be necessary to determine, as before, the portion of the changes in value of the futures contracts excluded from determination of effectiveness, but it will also be necessary to determine the ineffectiveness of the designated hedging relation. That is, the portion of the change in value of the of the futures contract due to changes in spot prices at a delivery point identified in the futures contract must be divided into the portion *effective* at hedging changes in discounted expected cash flows at the actual delivery point, and the *ineffective* portion. Only the effective portion will be recognized in OCI; the portion excluded from determination of effectiveness and the ineffective portion will be reflected in net income in the period of the change.

Statement 133, paragraphs 140–143, presents a framework to methodically determine the effective and ineffective portions of the change in value of the futures due to changes in spot prices at a delivery point identified by the futures contract. A table with the following layout can be used.

	FV of Fut. Contracts Due to Changes in Spot Prices at Delivery Points Identified in Fut. Contract Increase (Decrease)		Present Value of Expected Future Cash Flows on Hedged Transaction Due to Changes in Spot Prices at Local Delivery Point Increase (Decrease)		Lesser of the Two Cumulative Changes	Entry to OCI
Contract and Period End	Change During Period	Cumulative Change	Change During Period	Cumulative Change	(AOCI Bal.)	Dr (Cr)
	(1)	(2)	(3)	(4)	(5)	(6)
September Soy Meal						
June 30						
July 31						
August 31						

Column (1) lists, period by period, changes in the portion of the fair value of the futures that are due to changes in spot prices at the futures delivery location. That is, the fair value changes in this column are the changes designated by the company as being potentially effective hedges. It does not include the portion of fair value changes excluded from determination of effectiveness. Column (2) lists cumulative changes; these are the maximum possible amounts that could affect OCI. It is, however, possible that changes in the discounted expected cash flows of the hedged anticipated transactions are less than the changes in the designated portions of the hedging instruments. Cumulative changes in the hedged items limit the amount of derivative gain or loss that may be included in OCI. Column (3) lists periodic changes in discounted expected cash flows of the hedged transactions. Column (4) lists the corresponding cumulative change. Column (5) contains

the smaller in absolute value of columns (2) and (4), and is conceptually the smaller of the cumulative change in the hedging derivative and the hedged item. It is the cumulative effective gain or loss on the hedging derivative that should be reflected in OCI at the end of each period. (In the spreadsheet printout accompanying this case, the convention followed is to give column (5) the opposite sign as column (2); that is, a debit in column (2), indicating a cumulative increase in the value of the derivative, is matched by a credit in column (5), the balance in accumulated OCI.) Column (6) is the difference between the current and preceding rows of column (5). Conceptually, it is the adjustment that should be made to OCI in the journal entry marking the futures contracts to fair value. The entry will be balanced, if necessary, with an adjustment to net income.

Assume the same material as in the main scenario, except now assume that Mr. Smith, an avid NASCAR fan, chose to locate C.L. Smith and Sons in Atlanta, Georgia, to be closer to the sport he loves. One of the costs of this decision is that, although he can still use soybean futures for hedging purposes, he will have to determine ineffectiveness of the hedges due to differences between the spot prices for Toledo delivery, and those in Atlanta. Assume the following schedule of Atlanta spot prices.

	Soybeans	Soybean Oil	Soybean Meal
4–1–19X1	819.5	.24	274
6–30–19X1	772	.213	244
7–31–19X1	767	.22	254.5
8–31–19X1	671	.222	256.9

Required: Prepare only those journal entries that (1) mark the futures to fair value, with appropriate division of the total changes between net income and OCI and (2) that accomplish the reclassification of OCI to net income when the hedged transactions affect net income.

	A	B	D
149	PV of Expected Cash Flows on Hedged Transactions		
150			
151	Soybeans		
155			August
157	Original Spot Price		8.195
158	Month to Exp at 6/30		1
159			
160	June 30		
162	Spot price		7.72
163	Months from Jun30		0
165	FVd(spot)		243408
168	dFVd(spot)		243,408
170			
171	July 31		
173	Spot price		7.67
174	Months from Jun30		1
176	FVd(spot)		270375
179	dFVd(spot)		26,967
191			

	A	B	D
192	Soybean Oil		
196			September
198	Original Spot Price		0.24
199	Month to Exp at 6/30		2
200			
201	June 30		
203	Spot price		0.213
204	Months from Jun30		0
206	FVd(spot)		-150769
209	dFVd(spot)		(150,769)
211			
212	July 31		
214	Spot price		0.22
215	Months from Jun30		1
217	FVd(spot)		-112239
220	dFVd(spot)		38,530
222			
223	August 31		
225	Spot price		0.222
226	Months from Jun30		2
228	FVd(spot)		-101520
231	dFVd(spot)		10,719
232			
243			
244	Soybean Meal		
248			September
250	Original Spot Price		274
251	Month to Exp at 6/30		2
252			
253	June 30		
255	Spot price		244
256	Months from Jun30		0
258	FVd(spot)		-368308
261	dFVd(spot)		(368,308)
263			
264	July 31		
266	Spot price		254.5
267	Months from Jun30		1
269	FVd(spot)		-240597
272	dFVd(spot)		127,711
274			
275	August 31		
277	Spot price		256.9
278	Months from Jun30		2
280	FVd(spot)		-212040
283	dFVd(spot)		28,557
285			
286	September 30		
288	Spot price		
289	Months from Jun30		
291	FVd(spot)		
294	dFVd(spot)		

	I	J	K	L	M	N	O
297	Calculation of OCI Entry						
298							
299				Present Value of			
300				Expected Future			
301				Cash Flows on			
302		FV of Derivative		Hedged Transaction			
303		Increase (Decrease)		Increase (Decrease)		Lesser of	
304						the Two	
305		Change		Change		Cumulative	Entry to
306		During	Cumulative	During	Cumulative	Changes	OCI
307	Contract and Period End	Period	Change	Period	Change	(AOCI Bal.)	Dr (Cr)
311	August Soybeans						
312	June 30	(275,435)	(275,435)	243,408	243,408	243,408	243,408
313	July 31	(16,827)	(292,262)	26,967	270,375	270,375	26,967
314							
324	September Soy Oil						
325	June 30	158,586	158,586	(150,769)	(150,769)	(150,769)	(150,769)
326	July 31	(48,592)	109,994	38,530	(112,239)	(109,994)	40,775
327	August 31	(22,010)	87,984	10,719	(101,520)	(87,984)	22,010
328							
339	September Soy Meal						
340	June 30	351,120	351,120	(368,308)	(368,308)	(351,120)	(351,120)
341	July 31	(143,836)	207,284	127,711	(240,597)	(207,284)	143,836
342	August 31	(34,924)	172,360	28,557	(212,040)	(172,360)	34,924

Hedging Anticipated Commodity Transactions
with Futures—Alternative Scenario

Journal Entries, 6–30–19X1

Futures Contracts[1]	644,752	
Other Income[2]	318,331	
Futures Contracts		704,602
OCI[3]		258,481
(Recognize changes in fair values of futures contracts, and separate into effective and ineffective portions)		

Journal Entries, 7–31–19X1

Futures Contracts	252,689	
OCI[4]	211,578	
Futures Contracts		241,767
Other Income		222,500
(Recognize changes in fair values of futures contracts, and separate into effective and ineffective portions)		

Journal Entries, 8–31–19X1

OCI[5]	56,934	
Other Income	212,387	
Futures Contracts		269,321
(Recognize changes in fair values of futures contracts, and separate into effective and ineffective portions)		

Journal Entries, 9–30–19X1

Cost of Goods Sold[6]	270,375	
Sales[7]		260,344
Reclassification Adjustment (OCI)		10,031
(Reclassify OCI to earnings to match earnings impact of hedged transactions)		

Notes to Journal Entries—Alternative Scenario

1. All "Futures Contracts" entries are the same as those in the main scenario, because the values of the futures contracts are based on changes in the futures prices, which do not change between the main and alternative scenarios. Only the effective portion of the changes in spot prices related to the futures contracts changes between scenarios.

2. "Other Income" amounts balance the journal entries. Conceptually, they comprise (a) amounts excluded from determination of effectiveness and (b) the ineffective portions of changes in the fair values of the futures due to changes in spot prices. The ineffectiveness is due to different spot prices at the delivery locations identified in futures contracts, and spot prices in Atlanta.

3. The credit is the net of the "June 30" lines in the "Entry to OCI" column of the "Calculation of OCI Entry" spreadsheet printout. It consists of August beans, Dr 243,408; September oil, Cr 150,769; and September meal, Cr 351,120.

4. The debit is the net of the "July 31" lines in the "Entry to OCI" column of the "Calculation of OCI Entry" spreadsheet printout. It consists of August beans, Dr 26,967; September oil, Dr 40,775; and September meal, Dr 143,836.

5. The debit is the net of the "August 31" lines in the "Entry to OCI" column of the "Calculation of OCI Entry" spreadsheet printout. It consists of September oil, Dr 22,010; and September meal, Dr 34,924.

6. See line 6, "OCI Components Schedule."

7. See line 7, "OCI Components Schedule."

OCI Components Schedule—Alternative Scenario

		June	July	August	Total
Related to September Sales					
Line 6	August Beans	Dr 243,408	Dr 26,967		Dr 270,375
Line 7	September Oil	Cr 150,769	Dr 40,775	Dr 22,010	
	September Meal	Cr 351,120	Dr 143,836	Dr 34,924	Cr 260,344

J. Adams and Company Revisited: Accounting for Interest Rate Swaps in an Upward-Sloping Yield Curve Environment

Walter R. Teets

Robert Uhl

J. Adams and Company Revisited: Accounting for Interest Rate Swaps
in an Upward-Sloping Yield Curve Environment

Walter R. Teets and Robert Uhl

The base-case interest rate swap assumes a horizontal yield curve at all times. This assumption simplifies calculations, and allows the reader to focus on the accounting treatments. Rarely, if ever, will a horizontal yield curve environment exist. The pricing issues that arise with swaps in a sloping yield curve environment are worth examining, as these issues implicitly affect pricing of all derivative instruments.

The essential idea needed to understand pricing of interest rate swaps in a sloping yield curve environment is that forward interest rates are not generally the same as spot rates. Stated another way, interest rates are expected to change over time, implying that current *expectations* of *future* interest rates are not (generally) the same as the current interest rate. We will illustrate this in an upward-sloping yield curve environment. Assume that on January 1, 19X0, spot rates for zero-coupon bonds with maturities of 1, 2, and 3 years are 5%, 6%, and 7.0%, respectively. These spot rates imply that the market expects the one-year interest rate on January 1, 19X1, will be 7.010%, and the one-year interest rate on January 1, 19X2, will be 9.028%. (The 7.010% expected interest rate is called the one-year forward rate.) These implied forward rates can be calculated by recognizing that, in equilibrium, the expected return to the following two strategies must be the same. Strategy #1 is to invest one dollar at time $t = 0$ for one year at the (current) one-year spot rate, then invest the proceeds for another year at the forward one-year rate expected to prevail at January 1, 19X1. Defining S_1 to be the current one-year spot rate, and $F_{1,1}$ to be the one-year rate expected to be in effect at January 1, 19X1, the return to this strategy, R_1, is expected to be

$$R_1 = (((\$1) \times (1 + S_1)) \times (1 + F_{1,1})) - 1.$$

Strategy #2 is to invest one dollar at time $t = 0$ for two years, at the current two-year spot rate S_2. The expected return to this strategy, R_2, is expected to be

$$R_2 = (((\$1) \times (1 + S_2)) \times (1 + S_2)) - 1 = (1 + S_2)^2 - 1$$

In equilibrium, R_1 must be equal to R_2. If R_1 were greater than R_2, no one would invest money at the two-year rate—it would be better to invest at the one-year rate and role the investment over after one year at the new rate. Therefore,

$$\begin{aligned} (1 + S_1) \times (1 + F_{1,1}) &= (1 + S_2)^2 \\ 1 + F_{1,1} &= \frac{(1 + S_2)^2}{(1 + S_1)} \\ F_{1,1} &= \left[\frac{(1 + S_2)^2}{(1 + S_1)}\right] - 1. \end{aligned}$$

More generally, if $F_{1,x}$ is the one-year rate expected to prevail beginning x years in the future,

$$F_{1,x} = \left[\frac{(1 + S_{x+1})^{(x+1)}}{(1 + S_x)^x}\right] - 1.$$

This formula can be used to verify the spot and forward rates given above.

The preceding discussion of interest rate relations has several implications for swap pricing. First, expectations of cash flows beyond year one on the variable leg of the swap will be based on the implied one-year *forward* rates, not on the current one-year spot rate. Second, the expected cash flow for year 2 should be discounted at the two-year spot rate, the expected cash flow for year 3 should be discounted at the three-year spot rate, and so on. Third, the interest rate for the fixed leg of the swap will rarely be equal to the (one-year spot) rate on the variable leg at the inception of the swap. This is because the fixed rate is chosen such that the sum of the (identical) fixed payments, each discounted by the appropriate-length spot rate, is equal to the present value of the variable leg of the swap. The present value of the variable leg of the swap is equal to the sum of differing yearly payments, each discounted at the appropriate-length spot rate.[29]

Based on the preceding discussion of swap pricing in a sloping yield curve environment, redo the J. Adams and Company, Inc., example, using the following assumptions about the LIBOR yield curves at the initiation of the swap and at the two repricing dates. Assume the appropriate fixed-leg rate is 8.000%. Use LIBOR as the discount rate(s).

LIBOR Spot rates (in percentages)

Spot Rates	Inception of swap	Beginning of second year	Beginning of third year
One-year	7.500	7.250	8.250
Two-year	7.750	7.600	
Three-Year	8.028		

Before preparing journal entries, prepare schedules showing, at inception and at 12–31–19X1 and 12–31–19X2, the implied forward rates, the expected cash flows for the variable and fixed legs of the swap, the expected net cash flows, and the present value of the expected cash flows, discounted at the appropriate spot rates. Use the following tabular format.

Year	Spot Rate	Implied Forward Rate	Variable Leg Expected Cash Flow	Fixed Leg Cash Flow	Net Expected Cash Flow	Net Expected Cash Flow Discounted at Spot Rate
1						
2						
3						
					Value of swap (beginning of year)	

[29] A spreadsheet can be used to calculate implied forward rates, the present value of the variable leg of a swap, and the fixed rate required to equate the present values of the fixed and variable legs at the inception of the swap. It can also be used to calculate the values of the swap at future repricing dates. Send email to `teets@jepson.gonzaga.edu` for information on obtaining this spreadsheet. Except for determining the interest rate for the fixed leg of the swap, the calculations can easily be done with most financial calculators.

Preliminary Calculations

A number of values must be calculated before the journal entries can be prepared. All calculations are included here. (Most calculations were carried out in the spreadsheet referenced in footnote 29. The spreadsheet may carry some amounts to greater precision than those presented here.) The "Value of swap" is always the present value of the net expected cash flows, using the spot rate appropriate for each expected cash flow.

Fixed rate yearly receipt: $8.000\% \times \$1,000,000 = \$80,000$

Year 1 Values

Year	Spot Rate	Implied Forward Rate	Variable Leg Expected Cash Flow	Fixed Leg Cash Flow	Net Expected Cash Flow	Net Expected Cash Flow Discounted at Spot Rate
1	7.500	7.500	(75,000)	80,000	5,000	4,653
2	7.750	8.001	(80,010)	80,000	(10)	(7)
3	8.028	8.586	(85,860)	80,000	(5,860)	(4,646)
			Value of swap (beginning of year)			0

Net cash receipt (payment), end of year: $5,000
Interest accrual at end of year: –0–

Year 2 Values

Year	Spot Rate	Implied Forward Rate	Variable Leg Expected Cash Flow	Fixed Leg Cash Flow	Net Expected Cash Flow	Net Expected Cash Flow Discounted at Spot Rate
1	7.250	7.250	(72,500)	80,000	7,500	6,995
2	7.600	7.951	(79,510)	80,000	490	425
			Value of swap (beginning of year)			7,420

Net cash receipt (payment), end of year: $7,500
Interest accrual at end of year: 538

Year 3 Values

Year	Spot Rate	Implied Forward Rate	Variable Leg Expected Cash Flow	Fixed Leg Cash Flow	Net Expected Cash Flow	Net Expected Cash Flow Discounted at Spot Rate
1	8.250	8.250	82,500	80,000	(2,500)	(2,307)
			Value of swap (beginning of year)			(2,307)

Net cash receipt (payment), end of year: $(2,500)
Interest accrual at end of year: (193) ($2,308 \times 8.250\% \approx 190$. The difference of 3 is due to cumulative rounding errors.)

Extended Case—No Interest Rate Swap

Year 1			Year 2			Year 3		
Cash	75,000		Cash	72,500		Cash	82,500	
Interest Revenue		75,000	Interest Revenue		72,500	Interest Revenue		82,500
(Record interest on investment)			(Record interest on investment)			(Record interest on investment)		
Interest Expense	80,000		Interest Expense	80,000		Interest Expense	80,000	
Cash		80,000	Cash		80,000	Cash		80,000
(Record interest on debt)			(Record interest on debt)			(Record interest on debt)		
Interest Revenue	75,000		Interest Revenue	72,500		Bonds Payable	1,000,000	
Retained Earnings	5,000		Retained Earnings	7,500		Cash		1,000,000
Interest Expense		80,000	Interest Expense		80,000	(Pay off Bonds Payable)		
(Close nominal accounts)			(Close nominal accounts)			Cash	1,000,000	
						AFS (Bonds)		1,000,000
						(Redeem AFS Bonds)		
						Interest Revenue	82,500	
						Interest Expense		80,000
						Retained Earnings		2,500
						(Close nominal accounts)		

Abbreviated Financial Statements

Income Statement		Income Statement		Income Statement	
Other Income		Other Income		Other Income	
Interest Revenue	75,000	Interest Revenue	72,500	Interest Revenue	82,500
Interest Expense	(80,000)	Interest Expense	(80,000)	Interest Expense	(80,000)
Total Other Income	(5,000)	Total Other Income	(7,500)	Total Other Income	2,500

Balance Sheet				Balance Sheet				Balance Sheet			
Cash	(5,000)	B/P	1,000,000	Cash	(12,500)	B/P	1,000,000	Cash	(10,000)	R/E	(10,000)
AFS (Bonds)	1,000,000	R/E	(5,000)	AFS (Bonds)	1,000,000	R/E	(12,500)				

Summary Statistics (Population)

σ(Income) : 4,249

No Designation			Fair Value Hedge			Cash Flow Hedge		
12–31–X1 Journal Entries								
Cash	75,000		Cash	75,000		Cash	75,000	
Interest Revenue		75,000	Interest Revenue		75,000	Interest Revenue		75,000
(Record interest on investment)			(Record interest on investment)			(Record interest on investment)		
Interest Expense	80,000		Interest Expense[2]	75,000		Interest Expense	80,000	
Cash		80,000	Bonds Payable	5,000		Cash		80,000
(Record interest on debt)			Cash		80,000	(Record interest on debt)		
Cash	5,000		(Record interest on debt)			[4]Swap Receivable	12,420	
Swap Receivable	7,420		Cash	5,000		OCI		12,420
Gain on Swap		12,420	Swap Receivable	7,420		(Record fair value of swap		
(Record fair value of swap and cash received[1])			Gain on Swap		12,420	prior to cash receipt)		
Interest Revenue	75,000		(Record fair value of			[4]Cash	5,000	
Unrealized Gain on Swap	12,420		swap,including cash receipt)			Swap Receivable		5,000
Interest Expense		80,000	Unrealized Loss on B/P[3]	12,420		(Record payment on swap)		
Retained Earnings		7,420	Bonds Payable		12,420	[4]Reclassification		
(Close nominal accounts)			(Record change in fair			Adjustment (OCI)	5,000	
			value of hedged item)			Interest Revenue		5,000
			Interest Revenue	75,000		(Reclassify OCI recognized in earnings)		
			Gain on Swap	12,420		Interest Revenue	80,000	
			Interest Expense		75,000	Interest Expense		80,000
			Unrealized Loss on B/P		12,420	(Close nominal accounts		
			(Close nominal accounts)			(no Retained Earnings effect))		
			(no Retained Earnings effect))			OCI	12,420	
						Reclassification		
						Adjustment (OCI)		5,000
						Accumulated OCI		7,420
						(Close OCI to AOCI)		

Abbreviated Financial Statements, Year 1

Income Statement			Income Statement			Income Statement		
Other Income			Other Income			Other Income		
Interest Revenue		75,000	Interest Revenue		75,000	Interest Revenue		80,000
Interest Expense		(80,000)	Interest Expense		(75,000)	Interest Expense		(80,000)
Gain on Swap		12,420	Unrealized Gain (Swap)		12,420	Total Other Income		–0–
Total Other Income		7,420	Unrealized Loss (B/P)		(12,420)	OCI		
			Total Other Income		–0–	Unrealized Gain on Swap		7,420
Balance Sheet			Balance Sheet			Balance Sheet		
Swap Rec.	7,420	B/P 1,000,000	Swap Rec.	7,420	B/P 1,007,420	Swap Rec.	7,420	B/P 1,000,000
AFS (Bonds)	1,000,000	R/E 7,420	AFS (Bonds)	1,000,000		AFS (Bonds)	1,000,000	AOCI 7,420

No Designation			Fair Value Hedge			Cash Flow Hedge		
12–31–X2 Journal Entries								
Cash	72,500		Cash	72,500		Cash	72,500	
Interest Revenue		72,500	Interest Revenue		72,500	Interest Revenue		72,500
(Record interest on investment)			(Record interest on investment)			(Record interest on investment)		
Interest Expense	80,000		Interest Expense	73,038		Interest Expense	80,000	
Cash		80,000	Bonds Payable	6,962		Cash		80,000
(Record interest on debt)			Cash		80,000	(Record interest on debt)		
Cash	7,500		(Record interest on debt			Swap Receivable	538	
Interest Revenue		538	7.25% × 1,007,420)			OCI		538
Swap Receivable		6,962	Cash	7,500		(Accrue interest on beginning		
(Record net receipt on swap)			Interest Revenue		538	swap receivable)		
Unrealized Loss on Swap	2,765		Swap Receivable		6,962	Cash	7,500	
Swap Payable		2,307	(Record net receipt on swap)			Swap Receivable		7,500
Swap Receivable		458	Unrealized Loss on Swap	2,765		(Record cash received from swap)		
(Record change in FV of swap)			Swap Payable		2,307	Reclassification		
Interest Revenue	73,038		Swap Receivable		458	Adjustment (OCI)	7,500	
Retained Earnings	9,727		(Record change in FV of swap)			Interest Revenue		7,500
Interest Expense		80,000	Bonds Payable	2,765		(Reclassify OCI recognized in earnings)		
Unrealized Loss on Swap		2,765	Unrealized Gain on B/P		2,765	OCI	2,765	
(Close nominal accounts)			(Record change in fair			Swap Payable		2,307
			value of hedged item)			Swap Receivable		458
			Interest Revenue	73,038		(Record change in FV of swap)		
			Unrealized Gain on B/P	2,765		Interest Revenue	80,000	
			Interest Expense		73,038	Interest Expense		80,000
			Unrealized Loss on Swap		2,765	(Close nominal accounts)		
			(Close nominal accounts)			Accum. OCI	9,727	
						OCI		2,227
						Reclassification		
						Adjustment (OCI)		7,500
						(Close OCI components to AOCI)		

Abbreviated Financial Statements, Year 2

Income Statement		Income Statement		Income Statement	
Other Income		Other Income		Other Income	
Interest Revenue	73,038	Interest Revenue	73,038	Interest Revenue	80,000
Interest Expense	(80,000)	Interest Expense	(73,038)	Interest Expense	(80,000)
Unrealized Loss (Swap)	(2,765)	Unrealized Gain (B/P)	2,765	Total Other Income	–0–
Total Other Income	(9,727)	Unrealized Loss (Swap)	(2,765)	OCI	
		Total Other Income	–0–	Loss on Swap	(2,227)
				Reclassification	
				Adjustment	(7,500)
				OCI	(9,727)

Balance Sheet				Balance Sheet				Balance Sheet			
AFS (Bonds)	1,000,000	Swap Pay.	2,307	AFS (Bonds)	1,000,000	Swap Pay.	2,307	AFS (Bonds)	1,000,000	Swap Pay.	2,307
		B/P	1,000,000			B/P	997,693			B/P	1,000,000
		R/E	(2,307)							AOCI	(2,307)

No Designation			Fair Value Hedge			Cash Flow Hedge		
12–31–X3 Journal Entries								
Cash	82,500		Cash	82,500		Cash	82,500	
Interest Revenue		82,500	Interest Revenue		82,500	Interest Revenue		82,500
(Record interest on investment)			(Record interest on investment)			(Record interest on investment)		
Interest Expense	80,000		Interest Expense	82,307		Interest Expense	80,000	
Cash		80,000	Bonds Payable		2,307	Cash		80,000
(Record interest on debt)			Cash		80,000	(Record interest on debt)		
Interest Expense	193		(Record interest on LTD			OCI	193	
Swap Payable	2,307		8.25% × 997,693 ≈ 82,310			Swap Payable		193
Cash		2,500	Difference due to cumulative			(Accrue interest on beginning		
(Pay off swap)			rounding errors)			swap payable)		
Bonds Payable	1,000,000		Interest Expense	193		Swap Payable	2,500	
Cash		1,000,000	Swap Payable	2,307		Cash		2,500
(Pay off Bonds Payable)			Cash		2,500	(Record net payment on swap)		
Cash	1,000,000		(Pay off swap)			Interest Revenue	2,500	
AFS (Bonds)		1,000,000	Bonds Payable	1,000,000		Reclassification		
(Redeem AFS Bonds)			Cash		1,000,000	Adjustment (OCI)		2,500
Interest Revenue	82,500		(Pay off Bonds Payable)			(Reclassify OCI recognized in earnings)		
Interest Expense		80,193	Cash	1,000,000		Bonds Payable	1,000,000	
Retained Earnings		2,307	AFS (Bonds)		1,000,000	Cash		1,000,000
(Close nominal accounts)			(Redeem AFS Bonds)			(Pay off Bonds Payable)		
			Interest Revenue	82,500		Cash	1,000,000	
			Interest Expense		82,500	AFS (Bonds)		1,000,000
			(Close nominal accounts)			(Redeem AFS Bonds)		
						Interest Revenue	80,000	
						Interest Expense		80,000
						(Close nominal accounts)		
						Reclassification		
						Adjustment (OCI)	2,500	
						Accum. OCI		2,307
						OCI		193
						(Close OCI components to AOCI)		

Abbreviated Financial Statements, Year 3

Income Statement		Income Statement		Income Statement	
Other Income		Other Income		Other Income	
Interest Revenue	82,500	Interest Revenue	82,500	Interest Revenue	80,000
Interest Expense	(80,193)	Interest Expense	(82,500)	Interest Expense	(80,000)
Total Other Income	2,307	Total Other Income	–0–	Total Other Income	–0–
				OCI	
				Loss on Swap	(193)
				Reclassification	
				Adjustment	2,500
				OCI	2,307
Balance Sheet		Balance Sheet		Balance Sheet	
No Effects Remaining		No Effects Remaining		No Effects Remaining	

No Designation	Fair Value Hedge	Cash Flow Hedge
Summary Statistics (Population)		
σ(Income) : 7,188	σ(Income) : 0	σ(Income) : 0 σ(OCI) : 7,188 σ(AOCI) : 4,150

Calculations and Notes on Journal Entries

1. Since this is a speculative derivative, and there is no receivable on the balance sheet at the beginning of the year giving rise to interest revenue, the change in fair value of the swap and the cash received on the swap are classified as a gain. In future years, after a swap asset or liability exists, interest will accrue and cash payments may cover accrued interest as well as principal amortization.

2. Although the nominal rate on the bonds payable is 8%, the rates used for present-valuing the bonds payable and the swap are those from the (upward-sloping) LIBOR yield curve. To be consistent, these rates should be used in calculating interest on the bonds payable and the swap receivable (or payable). The interest rate at the inception of the swap is 7.5%, leading to $75,000 interest expense and $5,000 principal amortization.

3. Fair value of the bonds at the beginning of the year is

$$\frac{80{,}000}{(1+.075)} + \frac{80{,}000}{(1+.0775)^2} + \frac{1{,}080{,}000}{(1+.08028)^3} = 1{,}000{,}000.$$

   In journal entry #2, 12–31–X1, in the "Fair Value Hedge" column, $5,000 of the principal is paid off, leaving a beginning adjusted fair value of $995,000. At the end of the year, it is

$$\frac{80{,}000}{(1+.0725)} + \frac{1{,}080{,}000}{(1+.076)^2} = 1{,}007{,}420.$$

   The difference, $1{,}007{,}420 - 995{,}000$, is the unrealized loss on bonds payable, 12,420.

4. Adams and Company's accounting policy is to take all gains and losses on cash flow hedges through OCI, prior to recognition in earnings. That is the reason for recognizing the entire 12,420 increase in the value of the swap through OCI, prior to accounting for the cash received, then making the reclassification adjustment entry. An alternative treatment that would result in the same overall result would use the following two journal entries instead of the three entries in the table referring to this note.

Cash	5,000	
Interest Revenue		5,000
Swap Receivable	7,420	
OCI		7,420