Course Information

1 **Synopsis, Lecture of Week 12 of Course** Modify Manage Copy Remove

The first two hours addressed the charts on pp. 217–235 of the Cox and Rubinstein book. A scan of these pages appears in the Course Documents folder.

The final hour focused on issues relating to Collateralized Debt Obligations (CDOs), and their sub-families Collateralized Mortgage Obligations (CMOs) and Interest Only/Principal Only (IO/PO) instruments. Following, we examined features of Credit Default Swaps (CDSs), and entertained the fundamentals of copula theory, with mention of tail dependence and its relevance to the study of coordinated risk in low-frequency, high-cost events. The Nelsen book was cited as a good reference on copulas.

The session, and the course, concluded with suggestions for study for the final examination and expressions of good will to all.

Following are the references.

- Cox, John C. and Mark Rubinstein, Options Markets, Prentice–Hall, Upper Saddle River, New Jersey, 1985.
- Nelsen, Roger B., An Introduction to Copulas, Springer, New York 1999.

2 **Synopsis, Lecture of Week 11 of Course** Modify Manage Copy Remove

The session began with a general discussion of the Black–Scholes paper of 1973 in the Journal of Political Economy, with commentary on the prevailing ideas on options pricing of the time. Quickly we progressed to the formulations for call and put prices, and onto the various 'Greeks,' specifically delta, gamma, theta, vega, and rho, also the derivative of option price with respect to strike price, symbolized by kappa for this discussion. As well, elasticity with symbol omega was presented, and its description as the "bang for the buck" parameter, "buck" being the vernacular for "dollar" in the USA.

Next we analyzed graphically how the functions for call and put price evolve as expiration approaches. Noted was the anomaly (puzzle) that for deep in the money put options price can actually increase with time. Another anomaly came into view with the observation that an increase in interest rate provides an increase in call price — a positive rho. The one-period binomial model was used to illustrate the point, which is contrary to the notion that one would sell a call in the realm of rising interest rates to capitalize on the change. In fact, the increased return in the stock accompanying the rising rate is what induces the improvement in its derivative instrument. This concept is consistent with the usage of the risk-neutral environment for valuing options.

Further, we looked at combined delta–gamma hedging with two instruments. We showed that as a consequence of the linearity of the first and second derivatives a simple two-variable linear system gives the simultaneous solutions. The session concluded with some comments on 'fat-tailed' distributions, including the alpha-stable class which has infinite variance, except in the limiting case of the normal distribution. Stable distributions necessarily have infinite variance as a consequence of the Central Limit Theorem, which otherwise would require convergence of sums to the normal distribution.

3 **Synopsis, Lecture of Week 10 of Course**

Modify Manage Copy Remove

The session began with a discussion of the *ex post* calculation of mean and standard deviation of a series of *log* returns, with the observation that only the initial and final prices are needed to find the mean: $\mu = (1/n)\log(p_n/p_0)$. We addressed matters relating to the life cycle of the firm as they relate to the collection of data for these calculations. As well, we discussed the advantages and disadvantages of using daily *vs.* weekly data. Continuing, we studied a series of problems from the Hull text, focusing on the various issues of Chapters 12, 13, 15, and 16, specifically Problems

- **12:** *3, 7, 9, 11, 16*
- **13:** *6, 8, 27*
- **15:** *10, 18, 27*
- **16:** *4, 5, 16, 21, 22*

Following the discussion of the problems, we viewed author Hull's slides from Chapter 16, "Futures Options," with commentary.

4 **Synopsis, Lecture of Week 9 of Course**

Modify Manage Copy Remove

The session began with a review of an example of the one-period call option pricing model, showing that the "equivalent portfolio" as calculated for delta and the amount of borrowing is in fact equivalent to the performance of the call. Continuing, we examined in sequence the two-period model and then the multi-period model. The latter reduced to an expression of two terms for the call price, each incorporating an evaluation of the complementary binomial distribution function for appropriate assigned probabilities. An index $\hat{j}$ was calculated as a starting point for including only those terms relating to the call's being in the money at maturity.

Next we explored Itô's Lemma, leading to the Itô formula which incorporates a term with the second derivative of the space variable. The formula was then employed to verify the claimed solution of the stochastic differential equation for geometric Brownian motion, the assumed process for stock prices. In course, we discussed the nature of Brownian motion, that it is a Gaussian process with linear expansion of variance with time, and in particular that it has infinite linear variation, but finite quadratic variation.

As well, we discussed the Black-Scholes formula, comparing it with the multi-period model, noting that whereas the two are quite similar, the finite linear variation of the multi-period discrete-time model distinguished it from Black-Scholes, even in the continuous limit.

The session concluded with the presentation of subsets of author Hull's slides for Chapters 12 and 13, addressing the issues of the day. The assigned problems were deferred until the first hour of the next meeting.

5 **Synopsis, Lecture of Week 8 of Course**

Modify Manage Copy Remove

The first hour began with a review of the solution to Problems 9.23 and 9.24, as previously posted to Course Documents on this site, this time with graphic support. The discussion continued with an analysis of the one-period call option pricing model, with a specification of the replicating portfolio composed of investments in a fraction Δ of a share of stock and a zero coupon bond of amount B. The latter quantity then was demonstrated to be negative, thus constituting a borrowing or issuance of a bond for $-B$. Development proceeded to the simultaneous solution for Δ and B, given the setup, providing a determination for C, the value of the call. The variable Δ gained interpretation as the sensitivity of call price with relation to stock price, an idea promulgating to the multi-period and continuous Black–Scholes models to come.

In the second hour these ideas were extended by including the introduction of a probability space on the two paths as sample points, equipped with the measure induced by the coefficients of the terminal call prices, C_u and C_d, in the solution for C. Further, the model specified random variables for those call and related final stock prices. The presentation on the subject proceeded with calculation of expected returns on the call and stock, identifying them as risk-free, commensurate with the return on a risk-free zero coupon bond with its certain outcome. Comment on the risk-neutral frame of reference as relevant, therefore, to option pricing, followed, along with an example concluding the session.

A slide presentation occupied the substantial portion of the third hour, delving into a subset of author Hull's slides for Chapters 8–11. As some of these were mainly numerical without graphic support, and therefore challenging to interpret *in situ*, your instructor promised to provide analyses for some of them on this site.

6 **Synopsis, Lecture of Week 7 of Course**

Modify Manage Copy Remove

We are now back from the Midterm Examination and beginning the second half of the course, concentrating on options. During the first hour we reviewed the Exam, discussing various approaches to answering the questions. Some chose to apply continuous discounting (compounding), for instance, as opposed to simple interest calculations, making a calculator necessary for getting correct answers. This was quite OK, however simple interest calculations provided formulas for which easy hand computation was possible. Also, some minor ambiguities remained, for which students made choices. Such decisions were not consequential in the grading.

During the second hour we discussed and investigated basic properties of options, including specification of contracts, to include such features as 'who has the right' and 'who has the obligation,' and provisions for the later forced transaction if the party with the 'right' decides to exercise the option. The distinctions between puts and calls were presented, with the caveat that sometimes these are ambiguous, as when the assets to be exchanged on exersized are perceived as 'money' by both parties in different ways. One such instance, discussed, is an option specifying the exchange of U.S. dollars for Euros. If the buyer of this option thinks of dollars as 'money' and Euros as a 'non-monetary asset,' then the option is a call. If he thinks of Euros as 'money' and dollars as a 'non-monetary asset,' then the option is a put.

The main theory of this hour was the presentation and analysis of the put-call parity relationship $P - C + S = K\ exp(-rt)$ with an explanation which hypothesized a customer visiting a 'conversion house' asking for the exchange of a put option for a call option. This led the house to purchase shares of stock to complete a portfolio represented by the left hand side of the equation above. Seeing that this portfolio at time *t* must have value *K* in all circumstances led to the conclusion that the position is a zero coupon bond, and therefore must have present value of the striking price, the right hand side.

The third hour began with examples using parity, including the development of formulas for the 'deltas' of a put and a companion call (same underlying security, same strike and expiration date), and the common 'gamma' for both. Specifically these are (a) delta(call) – delta(put) = 1, and (b) gamma(put) = gamma(call). The session concluded with a discussion of the problems assigned for Chapter 9, with commentary showing that parity is the vehicle for solving four of the five problems.

Owing to time considerations no slides from author Hull's set for Chapters 8 and 9 were shown.

7 Synopsis, Lecture of Week 6 of Course

Modify Manage Copy Remove

This was the date of the Midterm Examination, taking the full time. Therefore there was no lecture.

8 Synopsis, Lecture of Week 5 of Course

Modify Manage Copy Remove

The first hour addressed issues relating to hedging using stock index futures contracts. The beta value, from the Capital Asset Pricing Model, is the primary statistic utilized to compute hedge ratios. Foundational material was presented relating to linear regression studies to determine empirically beta values for individual stocks. The main useful result of such regressions is the ability to estimate the expected value of returns on stocks given an observed return on the market, as represented by an index. It was noted that the beta value, the slope of the regression line, is a normalized covariance between a stock's returns and those of the market, with normalization (division) by the variance of the market's returns. As such, beta is a dimensionless quantity. It was also observed that the corresponding alpha value, the intercept of the regression, or the estimate of expectation on a stock's returns when the market's return is zero, is ordinarily statistically insignificantly different from zero, and is frequently ignored by forcing the regression through zero, at zero.

Various concerns relating to the determination of beta by regression were also discussed, including the issue that a stock's returns are well established not to be normally distributed, and in fact may not even have variances, in contradiction to an hypothesis of regression. The debate is ongoing in academic circles as to whether or not such variances are in fact infinite in the generating processes, with no consensus to date as to fundamental principles leading to a resolution. The main concern empirically is the paucity of data in the tails of distributions, and the consequent low confidence in statistics generated by their analysis. The R^2 statistic, or coefficient of determination, was also defined and discussed, both as to its relevance with regard to confidence in beta values, and also with reference to the selection of a stock index for hedging purposes, given a portfolio. Further statistics of regression and their relevance to the confidence of estimates were also presented, including tests for their presence. Among these, along with two example tests, are Fisher's F-ratio test for heteroskedasticy, the Durbin–Watson test for serial correlation of residuals, and multicollinearity, a concern only when more than one independent variable is present in a model. A hedging example followed, in which a stock with assumed beta of 1.5 was hedged with S&P 500 futures.

The second hour was consumed with a presentation of slides from author Hull's collection, these from Chapter 7, Swaps, the reading assignment for this lecture. The entire set was shown, with commentary. The main emphasis for fixed/floating interest exchange swaps was the crafting of agreements in accord with prevaling swap quotations, and the corresponding determination of net interest costs to the parties. Examples without and with the assistance of a financial intermediary serving in an agency capacity were discussed. The concept of notional principal was examined, with the observation that such practice is possible only when swaps are negotiated 'at the market,' and when the swapped currencies are the same. Currency swaps, accordingly, were discussed next, with the proviso that typically the currency principals are exchanged both upon entering and upon exiting the agreement. Complementary methods of valuation were also commented, the 'bond' viewpoint and also the 'forward rate agreement' viewpoint. Each was observed to contain the same information. Given the usual presentations of such information in tables, with column headings of 'fixed' and 'variable,' and with time running down the rows, the former viewpoint separates the data by columns, the latter by rows.

The final hour was invested in a discussion of two of the assigned problems, 7.12 and 7.18, and their solutions. Problems 7.1 and 7.9 were skipped, as they were similar to the examples involving Intel and Microsoft in the book, the former concerning and interest liability swap, the latter and interest asset swap. Problem 7.3 was ignored for insufficient information in the setup (the omission of a terminal cash flow in the variable interest stream.)

Lastly, some comments were provided as a study guide for the midterm exam relating to hedging short-term and long-term interest rate exposure. The two binary choices were discussed: hedging instruments 'on the books' or 'prospective,' and assets or liabilities. The principal concern in the short term is matching exposure periods. In this regard 'basis risk' for 'on the books' positions was presented, and its [partial] hedge by including extra 'tail' coverage in the remote futures contract. For the long term the main concept is duration hedging, with emphasis on the 'cheapest to deliver' cash instrument against a futures contract. A calculation, involving discounting the futures, utilizing the bond delivery 'factor,' and making comparison to the cash instrument concluded the discussion.

9 **Synopsis, Lecture of Week 4 of Course** Modify Manage Copy Remove

The first hour began with a discussion of delivery procedures for certain interest rate futures contracts. These included U.S. Treasury Bills, Notes and Bonds, and Eurodollar time deposits. Observed were that T-Bills, and Notes and Bonds are actually delivered, whereas Eurodollars have a cash settlement protocol whereby the Chicago Mercantile Exchange polls several London banks for LIBOR rates during the final 15 minutes of futures trading. For that settlement calculation the CME truncates the two high and two low observations, and averages the rest. All outstanding contracts at the conclusion of trading are then marked to market, as on any other day of trading.

Delivery of T-Bills involves all contracts remaining open at the conclusion of trading on the last day. Bills are sent by the seller to a bank approved by the CME through the Federal Reserve System wire transfer network. If the sending and receiving banks are both within one of the Fed's 12 Districts, then the transfer goes through that District's Federal Reserve Bank. Otherwise, the transfer goes to the network connecting all Reserve Banks at the 'Culpeper Switch' in Culpeper, Virginia. Payment for the bills takes the reverse course.

The procedure for Notes and Bonds is similar as to the passage of instruments and cash through the System, with differences pertaining to the selection of Notes or Bonds from the lists of eligible securities in the respective 'baskets', the choice being for the party who is short, and who initiates delivery. The list provision that Notes have at least seven years to maturity, and that Bonds have at least 15 years to maturity or first call, if applicable, was also presented and discussed. As well, these long-term securities are deliverable during a period of a few weeks at the end of futures trading to allow some flexibility in the trading of individual bonds which may not be liquid in the cash market. The 'wild card' embedded delivery option for Notes and Bonds was also presented, saying that a party short during the delivery period has from 2:00 p.m. in Chicago, when settlement prices are determined, to cash market closing at 4:00 p.m. to purchase an instrument for delivery, and to 8:00 p.m. to tender a notice. The settlement price serves as a striking price on this put option. On exercise (making delivery) the holder of the option receives cash. The value of this option, which can be assessed by standard options pricing methodology, is incorporated into the futures price, making it lower.

Additionally discussed were the 'index' price quotation methods for T-Bills and Eurodollars, deferring to the fact these are both 'discount' types of indices, even though the Eurodollars are quoted on 'premium' basis in the cash market. As well, it was noted that the T-Bill contract is standardized to 90 days, whereas the typical deliverable Bills have 91 days (thirteen weeks) to maturity, rarely 90 or 92 days owing to the occasional Thursday holidays, e.g., Thanksgiving, pushing the issue or maturity dates forward to Friday. Price adjustments on delivery are adjusted to the actual number of days on a linear accrual; an example was provided.

The second hour began with a presentation on the 'cheapest to deliver' Note or Bond, observing that the futures market, which is standardized to a 6 percent coupon bond by the 'factor' method of delivery invoice calculation, follows this Note or Bond by an arbitrage argument. Examples were presented. Following was a presentation of a selection of slides, with commentary, from author Hull's collection from the textbook for the assigned Chapter 6. Specifically, these were slides 1, 5–13 and 18–24. Next came a discussion of the assigned problems with referrals back to the slides: Slide 19 for Problem 6.13, and Slide 23 for Problem 6.17.

The final hour was consumed with hedging examples. Duration-based hedging with Notes or Bonds involves taking the product of two ratios to determine the proper number of contracts. One ratio is that of respective durations for the instrument or portfolio to hedge, and for the cheapest-to-deliver futures Note or Bond; the other ratio is that of the values of those respective quantities. Hedging short-term instruments involves time interval matching, the intervals representing the earning periods of the cash and futures instruments. Four cases were presented, the binary choices of cash instruments 'on the books' or 'prospective', and the positions being long or short. Basis risk for 'on the books' positions was discussed, as well as the effects of interval mismatches for all kinds. It was further observed that 'on the books' hedges require a reduction of the hedge position as maturity approaches, whereas 'prospective' hedges do not.

10 Synopsis, Lecture of Week 3 of Course

Modify Manage Copy Remove

We began the session with a description of several stock indexes and their methods of computation. First was the Value Line Index, presently of 1638 stocks, which has had two methods during its history. From its introduction in 1961 until 1988 the Index was calculated as a geometric average of share prices, adjusted by a 'divisor' for continuity over changes in the composition of stocks in the Index. This method puts all stocks on equal footing as to influence over changes in the Index, save for volatility in the return series, which, of course, favors the more volatile ones. Following the 1988 change, percentage returns for the Index have been calculated as the ordinary (arithmetic) average of percentage returns in the components. This method, as well, leaves all stocks equal save for volatility, but has the characteristic of never being less than the geometric average; Further, it approximates more effectively the performance of a market basket of equal values of stocks in the Index. The Value Line is preferred by investors and observers who want a broad market view, with more emphasis on mid-capitalized (mid-cap) stocks than offered by other popular indexes. A detailed description of the two methods of computation, direct from the Value Line, appears here: http://www.valueline.com/news/vlv080307ut.html.

Next for consideration came the Standard & Poor's 500, for which the method of calculation is by market value of the total common stock outstanding (not including treasury stock,) again as adjusted by a 'divisor.' Changes in the Index, therefore, exactly reflect this changing total common capitalization of the portfolio. This is the index most favored by professional money managers, including those directing mutual funds, hedge funds, and the like, for its broad market coverage and likeness to the behavior of the economy at large. A disadvantage to some is that capitalization other than common stock is not considered, leaving out preferred stock and debt. Some industries, most notably the public utilities, are heavily debt capitalized, so they are under represented in the index to those who think the alternatives should be included. Such persons frequently refer to the Miller – Modigliani theorem which states that under rather general assumptions capital structure does not affect the performance of a firm.

Lastly, we considered the Dow Jones Industrial Average of 30 stocks, which is computed as the straight average of the 30 share prices, adjusted by its 'divisor.' Given that there are only 30 stocks, and that they all represent significant companies in their industries, the mid-caps are totally ignored; Emphasis is on the companies with the highest share prices, and with those having greatest volatility. This is the best-followed statistic of all the stock averages around the world, especially in the United States.

Continuing, we discussed currency markets and introduced the interest rate parity principle, which identifies spot and forward exchange rates which make one indifferent to investment, with cover, in either of two currencies. Cover is defined as having a forward position which allows one to complete the investment in the home currency. An example comparing an investment alternatively in U. S. dollars and Euros was presented. This discussion completed the first hour.

In the second hour we looked at a selection of slides from author Hull's archive, these being for the current chapter of assignment, Chapter 5. Specifically, we looked at slides 1, 5–8, 10–12, 14, 16, and 18–23. These were mainly time-value-of-money studies in context of stock index, currency, and cash-and-carry investments, with passing notice of convenience yields for consumable commodities. We then entertained discussion of the assigned problems at the conclusion of Chapter 5, they being problems 5.9, 5.10, 5.12, 5.14, and 5.15. This discussion carried forward to the first part of the last hour.

Finishing the session we delved into mark-to-market concepts as they relate to the difference between futures and forward contracts, noting that the price path of a futures contract influences the ultimate outcome of a trade, whereas such influence is absent for a forward contract. This fact makes the formal analysis of futures contracts, in a stochastic setting, more challenging. As well, we placed these notions in context of the clearing process, requirements for margin deposits for public customers and clearing members of exchanges, and discussed aspects of financial protection for customers and members in times of price volatility.

11 Synopsis, Lecture of Week 2 of Course

Modify Manage Copy Remove

The second week lecture began with a brief review of the "conservation of momentum" formula: $DV = D_1V_1 + D_2V_2$, with an example relating to bond portfolio immunization. Herein, D is 'duration' and V is 'present value.' It was noted that this formula is a simple consequence of the equation $V' = V_1' + V_2'$, itself a consequence of the linearity of the differential operator (to provide some mathematical overkill to a basic idea. ;-) An example came next to illustrate the approximate calculation of duration, knowing only the change in price of a bond resulting from a given change in yield. Reference to the Mean Value Theorem established that this approximate result is actually precisely achieved for some yield intermediate between the beginning and ending yields, owing to the continuity of the bond formula.

Continuing, we advanced to study yield curves, first the 'ordinary' curve, and then the 'short rate' curve, observing the the ordinary curve is an 'average rate' curve, whereas the short rate curve is an 'instantaneous rate' curve. We noted that the two are connected by the Fundamental Theorem of the Calculus. The ordinary curve is what we typically see in the cash market, especially as it pertains to zero coupon bonds, whereas the short rate curve is what we see frequently in academic studies. The futures market presents a compromise yield curve, sometimes called the 'differential' yield curve, which depicts average rates over intervals of time.

From that point we began our study of the cash markets for short-term interest rates, e.g., U. S. Treasury Bills and Eurodollar time deposits, long-term interest rates, e.g., U. S. Treasury Notes and Bonds, foreign currencies, e.g., the U. S. dollar and the Euro, and stock market indexes, e.g., the Value Line, Standard & Poor's 500, and the Dow Jones Industrials. The auction process for Treasurys was described, including the submission of noncompetitive bids (also called tenders) and the ranking of competitive bids, along with the assignment of coupons for the longer term instruments.

Treasury Bills and Eurodollar time deposits were compared for qualities, the most important of them being the fungibility and 'full faith and credit' guarantee of Treasurys vs. the dependence of individual time deposits on the creditworthiness of accepting banks. In this context the TED spread (Treasurys against Eurodollars) was discussed, along with fundamentals as to how and why it widens or narrows. Characteristics of pricing formulas, linear for short term, compound for long term, with the distinctions and comparison of discount and premium bases also was presented.

With foreign currencies we dealt with the nature of the market, mainly a dealer market among banks, but also a broker market for customers of banks. The distinction was made between dealers, those acting as principals who accept risk, and brokers, those acting as agents for others who accept risk. The concept of interest rate parity came next with a commutative diagram shown to help explain the concept of 'cover,' an idea to reappear throughout the course, especially in the context of hedging with options.

Finally came a short introduction to stock indexes, to be developed in the third lecture to follow, observing that the different indexes are computed by different methods, which devolve upon them different characteristics, qualities to loom in importance as one addresses the futures and options markets on them for purposes of hedging.

12 Synopsis, Lecture of Week 1 of Course

Modify Manage Copy Remove

The course began with a welcome from your instructor and a brief discussion of procedural details. We then embarked on a review of basic 'time value of money' ideas, including definitions and properties of annuities in arrears and in advance, evaluated in the future and present. A presentation of continuous annuities followed, with the observation that the distinction between annuities in arrears and in advance disappears in the limit.

Two special kinds of cash flow patterns followed, the 'zero coupon' bond and the 'ordinary bond,' with coupons and principal. These were discussed in the context of annuity in arrears valuation, the commonly seen variety, with emphasis on the five variables of a bond — (1) present value, or price, (2) number of periods to return of principal, (3) size of principal, (4) size of coupon, and (5) periodic rate of interest, or yield. It was noted that variables 1–4 are easily calculated by algebraic manipulation. Variable (5) is only easily calculated when the number of periods is either 1, giving a linear equation in the rate of interest, or 2, giving a quadratic equation. It was remarked parenthetically that famous early-19th-century Norwegian mathematician Niels Henrik Abel, along with French mathematician Évariste Galois, was the first to prove that solutions of equations such as these with order 5 or higher cannot in general be solved with radicals.

Solution for the rate of interest in the bond formula, therefore, requires a numerical method. The most commonly employed is Newton's method, after Sir Isaac Newton. Demonstration of this method followed, along with the observation that the method possesses 'quadratic convergence,' providing an accurate solution to 8 or 10 decimal digits in 3 or 4 iterations. This is the method used in hand calculators which do bond formulas, as well as spreadsheets, Excel, e.g., and other intermediaries such as web applications. As well, looking ahead, this is the method for computing the implied volatility of returns on an underlying security to an option. As an aside, we discussed the termination algorithm for finding a solution to such equations to full machine accuracy, by Robert B. K. Dewar, professor *emeritus* of computer science at New York University.

Continuing with zero coupon and coupon-attached bonds the discussion turned to the concept of duration, defined as the partial derivative of the logarithm of bond value with respect to yield. An easily proved lemma came next, showing that the duration of a bond portfolio is weighted average of the durations of the component parts, with the weights based on present value. A corollary stated that the quantity 'price' times 'duration' is invariant to combination of components, with the notation that one may compare this quantity to the concept of conservation of momentum in physics.

With this result in hand, attention turned next to the idea of portfolio immunization, defined as targeting bond portfolio duration by combining components of known duration. This is an easy exercise using the corollary just mentioned. An example was provided.

The session ended with a look forward to next week's lecture, when the concept of convexity will be introduced, along with the Taylor series development of the price of a bond at a yield differing from a given yield. The coefficients of the first and second order terms will then be seen to be the now familiar duration and convexity.

The second lecture will encompass material about the primary and secondary markets for Treasury bills, notes, and bonds, Eurodollar time deposits, foreign currencies, and stocks and indexes on them. Following that will come detailed discussions of the functioning of futures markets, and uses of futures for hedging purposes, a subject to continue through the third lecture.

OK