

The IEM Assignment

Assignment Due: Last Class Meeting

Introduction

The Iowa Electronic Market (IEM for short) is a computerized market on which financial contracts can be traded (bought or sold). For use in finance classes, we have designed a special series of contracts based on three popular companies: Apple Computers (AAPL), IBM (IBM) and Microsoft (MSFT). Shares of these firms, representing partial ownership, trade over the counter (on NASDAQ) and on the New York Stock Exchange (the NYSE). Based on the share prices of these firms, we have created a series of contracts on the IEM under markets labeled the **Computer Industry Returns Market** and the **MSFT (Microsoft) Price Level Market**. These contracts are described briefly here and in more depth in the IEM Trade Manual. News along with demand and supply of shares affect share prices. For example, strong industry-wide sales can indicate better prospects for any or all companies. This means that their stock prices may increase. This, in turn, affects prices of the contracts being traded on the IEM.

The basic objectives of the IEM assignment are to:

- familiarize students with a trading environment (in this case, the IEM) where financial contracts can be bought or sold.
- familiarize students with a financial news and information sources.
- reinforce ideas from class including: market efficiency, return calculations, stock valuation risk and return and the CAPM.

Opening an IEM Account

All students need to open an account in the Iowa Electronic Market. This involves a minimum deposit of ten dollars. The deposit is refundable in full at the end of the semester if you do not trade on the IEM but merely observe prices of the contracts being traded. Following and analyzing market prices is sufficient for the course and no transactions or risks are necessary for participation. However, you may find that you wish to trade on your expectations.

To open an account, start by buying a Trader's Manual from the copy center. Fill out the application that your TA will give you and turn it in to the market administrator with any additional cash you wish to deposit in you account. There are also forms at the back of the manual that you can bring it to the IEM administrator in W283 PBAB. You will then be registered for trading on the IEM and have an account and password.

Address: IEM Administrator
W283 PBAB
University of Iowa
Iowa City, IA 52242

Phone: (319) 335-0881
Email: IEM@SCOUT-PO.BIZ.UIOWA.EDU

Accessing the IEM

You can access the IEM through one of the networks in PBAB or any of the eleven ITC computer labs on the University of Iowa campus (locations are in appendix C of the trader's manual). To attach to the market, get the network menu on your screen and select "IEM or Iowa Electronic Markets". At any main level menu, you can type "m" to select a market. Select the "Computer Industry Returns" or "MSFT (Microsoft) Price Level" markets to access the contracts for this class.

You can access IEM from telnet. If your communications program or TCP/IP telnet software has communication parameters, set them to: Data bits-8, Parity-none; Stop bits-1. Enter one of the following commands:

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telnet iem.biz.uiowa.edu    or    telnet 128.255.44.2.
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You can also connect via modem by dialing (319) 335-6200 and when you see the prompt "portal:" on your screen, respond by entering: telnet iem.biz.

Computer Industry Contracts

The Computer Industry Contracts actually consist of two series of contracts, one in the Computer Industry Returns Market and the other in the "MSFT (Microsoft) Price Level Market". Every month, existing contracts in each series are liquidated and payments are made as described below. Then new securities are created for each series as described below. Payoffs are determined on the day that the exchanged traded options for the underlying stocks expire: the Saturday after the third Friday of each month.

Computer Industry Returns Contracts: The liquidation values for these contracts are determined solely by the rates of return of Apple Computers Common Stock (AAPL), IBM Common Stock (IBM), Microsoft Common Stock (MSFT) and the S&P500 index (SP500). Whichever of these has the highest rate of return (dividend adjusted for AAPL, IBM and MSFT and capital gains for SP500) as specified below will payoff \$1.00 per share. The remaining contracts will payoff zero. (If two or more contracts tie for the highest return, the \$1.00 will be divided as evenly as possible among the tied contracts with any residual \$0.001's allocated in order of the highest to lowest final values.) In addition, a letter designating the month of contract designation will follow the ticker symbol. Thus, the contracts traded in this market are:

<u>Code</u>	<u>Contract Description</u>	<u>Liquidation Value</u>
AAPLm	Apple Computers	\$1.00 if AAPL NASDAQ Return Highest
IBMm	IBM	\$1.00 if IBM NYSE Return Highest
MSFTm	Microsoft	\$1.00 if MSFT NASDAQ Return Highest
SP500m	S&P 500 Market Index	\$1.00 if SP500 NYSE Return Highest

In these contract codes, "m" refers to the month of expiration as given by the following table:

<u>Month</u>	<u>Designation</u>	<u>Month</u>	<u>Designation</u>	<u>Month</u>	<u>Designation</u>
January	a	May	e	September	l
February	b	June	f	October	j
March	c	July	g	November	k
April	d	August	h	December	l

For AAPLm, IBMm and MSFTm, we will compute the dividend adjusted rates of return based on closing stock prices of the underlying listed firm between the option expiration dates in month *m* and the previous month. For these purposes, we will use closing prices from the third Friday of each month as given by the Monday, Midwest edition of the Wall Street Journal.

The Dividend Adjusted Rate of Return is calculated as follows. First, we compute the raw return on the underlying stock (the closing price on the third Friday of the month, minus the closing price from the third Friday of the previous month, plus any dividends on ex-dividend dates). Then, we divide the raw return by the closing stock price from the previous month to arrive at the dividend adjusted rate of return.

For the SP500 contract, we compute the capital gains return by subtracting the previous month's closing index value from the current month's closing index value and then divide by the previous month's closing index value.

MSFT (Microsoft) Price Level Contracts: The liquidation values for these contracts are determined solely by closing prices Microsoft Common Stock (MSFT). Each month, an initial pair of contracts consists of "MSxxxmH" and "MSxxxmL" where "m" corresponds to the month as given above and "xxx" corresponds to a price of \$xxx. The payoff for the "H" contract will equal \$1.00 if the Wall Street Journal closing price for Microsoft Common Stock on the third Friday of month *m* exceeds \$xxx. It will equal \$0.00 otherwise. The payoff for the "L" contract will equal \$1.00 if the Wall Street Journal closing price for Microsoft Common Stock on the third Friday of month *m* is less than or equal to \$xxx. It will equal \$0.00 otherwise. Finally, we will choose \$xxx to correspond to the strike price of the exchange traded option that lies closest to the price of Microsoft Common Stock on the third Friday of the previous month.

If the trading price of a particular contract becomes unusually high, the Directors of the IEM may authorize a contract split. When such a split occurs, the original contract will be split into two contracts. The prospectus posted on the IEM discusses stock splits.

Trading on the IEM

If you wish to trade, you can do so in several different ways. First, you can buy or sell by accepting other traders' outstanding asks or bids. On the market screen, you will see that some individuals have posted an order to buy (bid) or to sell (ask) a contract (e.g., MSFTm) at a specific price. If you believe that a posted order represents a good deal, you can buy or to sell at the posted price.

Second, you can buy or sell *unit portfolios*. A unit portfolio is a set of contracts such as AAPLm, IBMm, MSFTm and SP500m. Such portfolios can always be bought or sold for \$1.00 each. So when you start to trade and do not own any contracts, you can buy a unit portfolio and then start to trade.

Third, you can buy or sell by setting your own bid (to buy) or ask (to sell). To do so, you state the price at which you are willing to buy or sell a contract and then post the order on the screen, thereby waiting for someone to come and be willing to buy or sell at your stated price. In this manner, when your order executes, it will execute at your stated price, not at somebody else's. The negative is that the order may never execute because nobody likes your price (because it is too high or low).

Grading

Your participation in the IEM will comprise 10% of your course grade and consist of several parts.

Part 1: Trading on the IEM as a Securities Market

Trading on the IEM is structured much as it is on the NASDAQ and NYSE. Thus, orders are similar to those on the NASDAQ and NYSE. Identify how you would place the following types of orders:

- i. A market order to purchase MSxxxmH.
- ii. A limit order to sell MSxxxmL at \$0.510.
- iii. A limit order to sell IBMm at \$0.450 that turns to market at 5:00.

Part 2: Arbitrage on the IEM

Arbitrage opportunities sometimes arise on the IEM. From the following bids and asks, identify the arbitrage opportunity and explain how you would exploit it.

<u>Contract</u>	<u>Bid</u>	<u>Ask</u>
AAPLm	0.250	0.252
IBMm	0.336	0.339
MSFTm	0.401	0.405
SP500m	0.023	0.024

If you exploit the opportunity, what will eventually happen to the level of the bids and/or asks for each security?

Part 3: Risk on the IEM

Part 3a: Select one security from the IEM MSFT (Microsoft) Price Level Market. For a particular date, find that security's price. Assume that this price represents the probability that this contract will pay \$1. Thus, the contract will pay \$0 with a probability of 1 minus this price. What is the expected value of this contract? What is the variance and standard deviation in the contract's value?

Part 3b: What is the market portfolio in the MSFT (Microsoft) Price Level Market? What is the minimum risk portfolio? If you hold the minimum risk portfolio, what is the variance in your

return? Given this, what is the correlation between MSxxxmH and MSxxxmL?

Part 3c: What is the risk free asset in the IEM? What is its return? Given this, what is the overall expected return for holding any single contract in the IEM according to CAPM?

Part 4: Expected NYSE and NASDAQ Returns

Part 4a: For this part of the assignment, you are required to find and record "beta's" for each company's common stock. As we will explain in class, a company's "beta" is a standard measure of the company's risk and should determine the returns expected for the company's stock. Beta's can be found from the following sources:

1. Value Line Investment Survey (ask for it at the Info Desk in the Business Library)
2. Standard & Poor's Reports (in the Reference Collection of the Business Library)
For IBM, use the NYSE report, call number: HG4905.S66.
For AAPL and MSFT, use the OTC report, call number: HG4905.S663
3. S&P Stock Market Encyclopedia (in the Business Library) Call number: HG4921.S23
4. Bloomberg (ask about at the Information Desk in the Business Library)
Type in ticker symbol (e.g., AAPL) and press the green Quote 2 key.
Beta is in upper right hand corner #1.
5. Value Screen (in the computer lab).
Select the Value Screen group from windows.
Select the Value Screen icon.
Select "S" for screen database.
Press "F-7" and enter the ticker symbol (e.g., AAPL).
Finally "F-2" to show the company's report, which includes beta.

Part 4b: Given the betas you find, you should calculate the one-month CAPM expected return for each company according to the following assumptions:

1. The one-month T-Bill return is: 0.45%.
2. The one-month expected market return is: 1.00%

Part 4c: Given this information you should determine which security in the returns market should be priced the highest on the day that trading in this market opens and explain why this should be the case.

Part 5: Discounted Dividend Model Valuations

Part 5a: Fixed Dividend Model. You should find the most recent quarterly dividend for one of the companies (AAPL, IBM or MSFT). The IEM news sections with contain recent dividend information for each contract. Given this, you should calculate prices according to the following assumptions:

1. The company pays fixed, quarterly dividends equal to the last dividend paid.

2. The next dividend will be paid in exactly one quarter.

Explain why the stock prices calculated here might differ from those found the Wall Street Journal.

Part 5c: Historical Growth Model. To get a more realistic estimate of the company's stock price, look up the five year historical growth rate in dividends (using Bloomberg, ValueScreen or company annual reports). Use this as the growth rate along with last quarter's dividend and the CAPM required return to find the price of the company's stock using the Gordon growth model.

Part 5d: A Simple Projected Growth Model. To get an alternative estimate of the company's stock price, look up the company's ROE and retention rate (using Bloomberg, ValueScreen or company annual reports). Determine the projected growth rate in dividends from these numbers and find the price of the company's stock using the Gordon growth model, the CAPM required return and this projected growth rate.

Part 5e: Pro-Forma Analysis (Advanced). Here, you will use pro-forma analysis as an alternative means of determining dividends. To do this, obtain last years balance sheets and cashflow statements for one of the companies from the annual report, Edgar, Bloomberg, ValueScreen or some other source. From the same source, find the five year growth rate in sales. Project the financial statements for this company for the next five years using the percent of sales method. Assume that the capital structure stays fixed and the retention ration stays fixed. Assume that the average growth rate in dividends projected for the next five years will hold forever and find the price of the company's stock using the Gordon growth model, the CAPM required return

Part 5f: The Implied Growth Rate. As an alternative way of determining growth rates, use the current dividend, the CAPM required return and the current stock price to solve for the growth rate according to the Gordon growth model.

Part 5g: Given the information above, what do you believe the current stock price and growth rate in dividends should be? Be sure to be consistent and justify your answer.

Part 6: Price and News Log

For this part of the assignment, you are required to build a price and news log for the companies trading in the Computer Industry Market. Specifically, to construct a price log, choose an eight consecutive week period during the semester and record the following information once a week on the same day each week:

1. Wall Street Journal closing prices for each underlying security.

IBM stock prices can be found in the NYSE Composite Index each day; Microsoft and Apple stock prices can be found in the NASDAQ Index each day and the S&P500 Index is listed in the upper left corner of page C1 each day.

2. IEM last trade prices for each IEM traded security.

These prices can be found under 'Contract Daily Prices' in the 'Market Information' screen on

the IEM.

You are also asked to find one news article from any source on each company (Apple, Microsoft and IBM) that you believe should affect stock prices for that company. For each article, you should explain how you believe the information will effect prices for the company's stock and prices for the company's securities on the IEM. In particular, how do you think this news will effect prices and dividend growth rates from part 5? Then, you should compare your predictions to the actual price changes recorded in your price log.

Part 7: Actual Returns and Payments

The trading log you created in Part 1 will contain at least one complete cycle of creating, trading and liquidation for the securities traded in the Computer Industry Markets. (This cycle will run from the third Friday in one month to the third Friday in the next month.) Select one monthly trading cycle to complete this part of the assignment.

Part 7a: For that month, calculate the capital gains return for each stock (AAPL, IBM and MSFT) and the S&P500. To do this, use the closing prices from the third Friday in each month.

Part 7b: Calculate the Dividend Adjusted (Total) Returns for that month for each stock (AAPL, IBM and MFST). Again, the IEM news screens will contain dividend information.

Part 7c: The actual returns calculated here will likely differ from those calculated from the CAPM above. Explain why they might differ.

Part 7d: From the monthly total returns on the stocks and the capital gains return on the S&P500, calculate Effective Annual Yield (EAR) for each stock (AAPL, IBM and MFST) and the S&P500.

Part 7e: From you calculations and price log, determine which IEM securities should have paid off \$1 and which should have paid off \$0. Did they? Explain any discrepancies you find.

Completing Your Assignment and Submitting It

As you can see, this is an extensive, multi-part assignment that draws together many concepts from the class. It would be wise to work on the various parts of the assignment as we go over the relevant topics in class. To prepare the assignment for submission, please use the following guidelines:

1. Clearly label your assignment with a cover page giving your name, student number, TA section number and your TAs name.
2. Complete each part in a separate section clearly labeling the "Part 1," "Part 2" and "Part 3."
3. Within each section, give the requested information, including sources of information gathered and equations for calculated results.
4. Turn in your completed assignment to your TA on or before the last TA session (December 8).