Investor (Jensen and Fontanier)

Final Exam 2024

- NAME: _____

- COHORT: _____

- TIME ALLOWED: **3 hours**

- Please do not open the exam until you get the go-ahead.

- There are 6 questions. Each question has a number of subparts. Each subpart of a question (e.g., 1a, 3c, 4b) is worth the same number of points.

- Laptops and tablets are not allowed, but calculators are. You cannot use your phone or watch as a calculator.

- The exam is closed-book. You **must not** consult (using electronic devices or otherwise) any information other than that given in the exam or on your "cheat sheet."

- You can receive partial credit for incorrect answers only if you show your work.

- More challenging subparts of questions are indicated with asterisks (**). If you get stuck on something, move on. All 6 questions contain some straightforward subparts.

- For a quantitative question, please underline or box your answer so that we can easily find it.

- Please give **brief** and **precise** answers. Do not write everything you know about a topic in the hope that somewhere you will hit the right answer. Rambling, unfocused answers will be penalized.

1. **The following are short answer questions:**

   For each of the following statements,

   - Say whether the statement is true, false, or uncertain.
   - Provide a *short* justification for your answer (your score is based on your justification).

   (a) Suppose a security is positively correlated with the market and more volatile than the market. This security has a beta greater than 1.

(b) You are given two risky assets. By combining them, you can create a set of portfolios that form a curve in a figure with expected return on the y-axis and standard deviations on the x-axis.

(c) (**) Suppose the expected inflation rate suddenly rise from 2% to 4%. The rise in inflation will cause stock prices to fall.

2. **This question is about asset allocation and the CAPM**

For this question, suppose the CAPM holds, Treasury bills (T-bills) are risk-free, and you have the following information about expected returns and standard deviations for the next year:

Asset	$E(\tilde{r})$	$S(\tilde{r})$
T-bills	4.00%	0.00%
Market	7.00%	15.00%
AAPL	7.00%	30.00%
TSLA	8.50%	45.00%
NVDA	7.60%	60.00%

(a) First, from the perspective of the CAPM, which of these securities are the best investment. Second, which of the assets have the highest covariance with the market? Justify your answers.

(b) Suppose an investor puts 40% of their wealth into Market and 60% of their wealth into NVDA. Suppose also that the covariance between Market and NVDA is 0.027. What is the expected return and the standard deviation of the portfolio? Further, what is the mean-variance utility (that is, the utility function we covered in class) of the portfolio if the investor's risk aversion is $\gamma = 2$?

(c) (**) Suppose an investor with mean-variance utility can only invest in T-bills and *one* of the risky assets in the table above (including the Market). The investor cannot invest in a combination of risky assets. Suppose also that the investor's risk aversion is $\gamma = 2$. Which risky asset should the investor choose to invest in and what fraction of their wealth should they allocate to the risky asset?

3. **This question is about prices, the CAPM, and the investment management industry.**

   (a) Suppose that a stock is expected to pay a dividend of $2mil in one year, a dividend of $3mil in two years, and nothing thereafter. Suppose also that the stock has a beta of 1.5, the expected return on the market portfolio is 7% and the risk-free rate is 4%. How much would you be willing to pay for the stock today? Justify your answers using the tools you have learned in class.

(b) (**) Suppose we live in a world where it is only possible to invest in two types of portfolios: a low beta portfolio with a beta of 0.5 and an expected return of 8%, and a high beta portfolio with a beta of 2 and an expected return of 8%. The expected market return is 8% and the risk-free rate is 0%. Now consider two investment managers: a mutual fund manager that cannot short sell or buy on margin, and a hedge fund manager than can do both. Explain why the CAPM is violated in this scenario. Then explain how (1) the mutual fund manager and (2) the hedge fund manager should exploit this violation. *Hint: No calculations are necessary to answer this question.*

4. **These are qualitative, short answer questions.** *Be very brief*

    (a) We have looked at the typical behavior of the stock price of a company in the days surrounding earnings announcements. Explain (also with the help of a simple figure) what this typical behavior is.

(b) What is the classic theoretical argument that is used to support the position that markets are efficient?

5. **This question is about Fixed Income.**

   (a) **This question is about bonds:**

   Suppose that in December 2024, the prices of zero-coupon bonds (ZCBs) with face values of $1,000 maturing in December 2025, December 2026, December 2027, and December 2028 are:

	Price
December 2025 ZCB	$990.00
December 2026 ZCB	$975.00
December 2027 ZCB	$950.00
December 2028 ZCB	$917.00

   Let r_t be the t-year spot rate. Using the price information in the table, compute r_1, r_2, r_3, and r_4 as of December 2024.

(b) Given your answers in part (a), what would be a fair price, in December 2024, for a 3-year Treasury Bond with face value of $1,000 paying an annual coupon of 4%?

(c) You see on Bloomberg that the quoted price for a 3-year Treasury Bond with face value of $1,000 paying an annual coupon of 4% is currently $1,050. Which trade can you implement to make a profit? How much profit can you make?

6. **This question is about futures.**

Let today be denoted as year 0. The spot price of a unit of platinum is currently $14.37. You see in the *Wall Street Journal* that future platinum is currently trading at the following prices for a range of different maturities. Assume futures markets participants can borrow and lend at the risk-free rate and that it is costless to store platinum.

Maturity (years)	1	2	3
Futures Price	15.29	16.10	16.61

(a) What are the spot risk-free interest rates over horizons of 1, 2, and 3 years?

(b) What is the definition of the "yield curve"? What do the results above imply about market participants' expectations for future economic conditions? Explain.

(c) (**) Now, we will change the assumption regarding storage costs. Suppose that platinum storage facilities offer free storage for one year, but charge storage costs $1 per year paid at the end of each additional year. What would each of the futures prices be in this scenario?