Question 1

The CEO and CFO of a company are debating investing in a project that will require an upfront investment of $100 million. The company's analysts have estimated the NPV of the project to be $1 million. The CFO argues that the company should undertake the project since it is positive NPV. The CEO pushes back, arguing that the $1 million NPV is small relative to the required investment of $100 million, so the project does not generate enough of a return to compensate the company's investors for the opportunity cost of the $100 million of capital. The company can access as much capital as it needs, and the project is not mutually exclusive with any other project. Who is correct, the CEO or CFO, and why?

Question 2

Company A is a public corporation specializing in the production of smart phones. Currently, Company A is evaluating a project to produce a next-generation smart phone. The management of Company A knows that Company B, a newcomer to the industry, is also planning to introduce a next-generation smart phone. In the recent past, Company A has applied a cost of capital of 12% in valuing smart phone projects. However, the CEO objects to using the same cost of capital for the new smart phone project, saying, "This time, we are facing additional risk. If Company B's new smart phone turns out to be technologically superior to ours, then our cash flow will be $10 million lower than our projections. To account for the additional risk in cash flows, we should use a higher discount rate than we normally use." Do you agree with the CEO? Please provide the rationale behind your answer.

Question 3

A real estate development company is considering purchasing litigation insurance against the risk of being sued over an office building it is constructing. A large lawsuit could drive the company into bankruptcy. The company is publicly traded and is planning to increase its leverage by issuing new debt and buying back shares soon. The CFO is against purchasing insurance. She says, "The risk of being sued is completely idiosyncratic, and we are a publicly-traded company, which means that our shareholders are not worried about idiosyncratic risk. Therefore, insuring against idiosyncratic risks is redundant." Assume here that the company will incur bankruptcy costs if it defaults on its debt. Do you agree with the CFO? Please explain.

Question 4

A company has a lot of fixed-rate debt (i.e., debt where the interest rate is set in advance and does not change over time) outstanding. Interest rates have dropped substantially since the company issued this debt. The company's Treasurer argues that "because interest rates have dropped, our company should buy back its current debt and issue new debt to save on interest costs." The CFO answers that this only makes sense for "the bonds with call provisions and not on the bonds that we would have to buy back in the market at the market price." A call provision allows the company to force holders of the debt to sell the debt back at par value (i.e., at the price at which it was initially issued). Who is right? Why?

Question 5

Dallas Software is an all-equity financed, publicly-traded software company. It is generating cash flow exceeding its investment needs. The CEO of the company proposes using the excess cash to buy a publicly-traded restaurant chain. The CEO argues that "We are generating more cash than we need, so we have free cash, and we should invest it in something, even if the returns to that investment are less than our cost of capital. In addition, we would diversify away a lot of our cash flow risk since the cash flows from the software and restaurant businesses are largely uncorrelated, and this diversification will make our shareholders happy." Does each of the CEO's two arguments make sense? Assume that there are no tax considerations here.

Question 6

A CFO says, "In our company, shareholder value comes first. Therefore, for each project we consider, we calculate NPV (i.e., the present value of future cash flows minus the current cost of taking on the project), and we choose not to invest if the NPV is negative." Is the CFO's argument that maximizing shareholder value always implies passing up negative NPV projects correct? Justify your answer.

Question 1

Assume that the S&P 500 is the market portfolio and is also the tangency portfolio. The S&P 500 has an expected return of 12%, with a standard deviation of 25% per year. Apple's stock has an expected return of 16%, with a standard deviation of 40% per year. The risk-free rate is 4%. Assume that CAPM holds for the remainder of this problem.

1a) (7 points) Is this combination of expected returns and standard deviations possible according to the CAPM? Why or why not?

1b) (8 points) Now, suppose, contrary to above, that we do not know the expected return of Apple's stock or the standard deviation of its return. However, we do know that its covariance with the S&P 500 is 0.1. What is the expected return on Apple's stock?

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1c) (7 points) Suppose that the expected return on Apple's stock is as in part a (i.e., 16%). Suppose that the expected return on Intel's stock is half of the expected return on Apple's stock. What is the beta of Intel's stock?

1d) (8 points) Suppose that the expected return on Apple's stock is as in part a (i.e., 16%). Calculate the expected return and beta of a portfolio that invests in the following five assets in the following proportions:

- 30% in Apple
- 30% in Intel
- 30% in the S&P 500
- -20% in GM (expected return = 5%)
- 30% in the risk-free asset.

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Question 2

Companies A and B each generate identical cash flow one year from today and then cease to operate. Current information about the outstanding securities of the two companies is as follows:

Company A:
1,000 common shares outstanding, with a current market price of $60 per share
200 senior bonds outstanding, with a current market price of $165 per bond
200 junior bonds outstanding, with a current market price of $135 per bond

Company B:
2,000 common shares outstanding, with a current market price of p per share
500 preferred shares outstanding, with a current market price of $20 per share
200 bonds outstanding, with a current market price of $150 per bond

The bonds of both companies will pay the holder principal and interest due one year from today. There are no taxes.

2a) (10 points) Assuming no arbitrage, what should the price of Company B's stock (p) be?

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2c) (10 points) Now, suppose that everything is as before, except that Company B does not have any preferred stock outstanding and it has 400 bonds outstanding instead of 200. Its outstanding securities then are:

Company B:
2,000 common shares outstanding, with a current market price of $45 per share
400 bonds outstanding, with a current market price of $150 per bond

Assume that Company B's bonds are risk-free. The risk-free rate is 10%. Suppose that you own 200 shares of Company B's common shares as well as 40 of its bonds. Suppose that Company B borrows $18,000 by issuing 120 additional bonds at a price of $150 per bond, where these new bonds are, like Company B's original bonds, risk-free. Company B then uses the proceeds from this additional borrowing to repurchase 400 common shares at a price of $45 per share. Suppose that you did not sell your shares back to the company but want to counteract Company B's financial restructuring so that your payoffs are the same as they would have been absent the restructuring. What financial transactions do you need to make after the restructuring in order to restore the payoffs you would have received in the absence of the restructuring? Demonstrate that these transactions will, in fact, ensure that your payoffs are exactly the same as they would have been absent the restructuring.

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For the rest of the problem, ignore your calculations in part a, and assume that the price of Company B's stock is, in fact, $45 per share.

2b) (10 points) Use the six securities described above (Company A's common shares and bonds and Company B's common shares, preferred shares, and bonds) to construct an arbitrage portfolio (i.e., one that generates a positive profit today with no future risk) that includes exactly 200 of Company A's common shares. How large are the arbitrage profits from this portfolio? Construction of this arbitrage portfolio will require short-selling some of the securities. Assume that we can short sell at no cost.

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Question 3

Company A and Company B will each company operate for one year and then cease to exist. Company A's operations will generate cash flow of $100M if the economy is in an expansion and $40M if the economy is in a recession. Company B's operations will generate cash flow of $20M if the economy is an expansion and $110M if the economy is in a recession. An expansion and a recession are equally likely. Company A has debt with a face value of $50M to be repaid at the end of the year. Company B also has debt with a face value of $50M to be repaid at the end of the year. Assume no discounting, no taxes, and no financial distress costs.

3a) (10 points) What is the current market value of Company A's equity? Company A's debt? Company B's equity? Company B's debt?

3b) (10 points) Now, suppose that Company A announces that it is acquiring Company B and merging it into its own operations. The merger will not change the cash flows that either Company A's or B's operations will generate. That is, the combined company will generate cash flows equal to the sum of Company A's and B's standalone cash flows. Company A will pay the market price of Company B's equity that you calculated in part (a) to acquire Company B. Specifically, it will give Company B's shareholders equity in the merged company that is worth Company B's standalone market value. Company A will also assume Company B's debt. Immediately after the announcement, but before the transaction takes place, what will be the market value of Company A's equity? Company A's debt? Company B's debt?

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3c) (10 points) Finally, suppose that Company A announces that it acquiring Company B for the same price as in part (b), but instead of combining the two companies, as in part (b), Company A will maintain Company B as a separate wholly-owned subsidiary. Company A will not be responsible for its subsidiary's (i.e., Company B's) debt, and the subsidiary will not be responsible for Company A's debt. The subsidiary would pay any cash remaining after repaying its creditor at the end of the year to Company A as a dividend, which Company A would then use to repay its own debt if its own cash flow is insufficient. The acquisition terms are the same as in part (b). Immediately after the announcement, but before the transaction takes place, what will be the market value of Company A's equity? Company A's debt? Company B's debt?

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Question 4

Super Company Inc. needs to spend $100,000 at year 0 to develop a new product. The demand for product is uncertain at year 0. At year 1, Super Company and prospective investors will learn whether the demand for the product is high (probability 1/2) or low (probability 1/2). To continue operations after demand is observed, Super Company must spend an additional $60,000 at year 1 to market the product. If Super Company markets the product, the product will generate cash flow in year 2 of $360,000 if demand is high and $120,000 if demand is low. The project will generate no additional cash flow after year 2. Assume that Super Company can only raise funds at year 1 by issuing new equity. Super Company owns no other assets. Assume no discounting, no taxes, and no bankruptcy costs.

4a) (8 points) Assume that Super Company intends to finance the original $100,000 at year 0 by issuing senior debt that matures in year 2. Will Super Company be able to do so? If it can, calculate the face value of the senior debt. Calculate the value of Super Company's equity right after it raises the $100,000 by issuing senior debt. Hint: The face value of the debt must be at least $100,000 for creditors to break even on average.

4b) (8 points) Suppose that the face value of debt is as you calculated in part a. Assume that creditors could get together and renegotiate the face value of the debt in the case of low demand. If demand is low, will the creditors agree to renegotiate their debt? If so, what is minimum amount by which they will be willing to reduce the face value of the debt when demand is low?

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4c) (8 points) Suppose that creditors anticipate that they will renegotiate the face value of debt in the case of low demand by the amount you computed in part b. What is the face value of the debt that Super Company must issue at year 0 in order to raise the $100,000 it needs to develop the new product? What is the value of Super Company's equity at year 0, right after the company raises the $100,000 it needs to develop the product? Briefly explain why the face value of the debt is higher or lower than in part a and why the value of the equity is higher or lower than in part a.

4d) (6 points) Now, assume that in the case of high demand Super Company can spend $60,000 to market the product at year 1 in one of two different mutually exclusive ways:

- Safe marketing, which yields a CF of $360,000 at year 2
- Risky marketing, which yields a cash flow at year 2 of either $1.2 million, with probability 0.2, or $0, with probability 0.8.

Super Company plans to finance as much as possible of the initial investment at year 0 by issuing senior debt and the rest by issuing equity. Up to how much of the initial $100,000 can Super Company finance with senior debt? Assume in this part of the question that creditors cannot renegotiate Super Company's debt in year 1 when demand is low.