Name: _____

Finance II (441) Professors Matsa

Corporate Finance Final: Practice Exam C

1) Time limit. You have 2 hours to complete the exam.

2) The exam is closed book and closed notes. You may not use any outside material. You may use a calculator or a blank excel spreadsheet. No other materials may be used during the exam (e.g. you may not use any information from your hard disk or the web). The last page of the exam contains a list of formulas taken from my lectures and the textbook. These formulas may or may not be useful for solving the exam.

3) You should have 11 numbered pages. Point totals for each question are specified in parentheses. There are 240 total points.

4) Circle your numerical answers. This makes it easier for me to find them. Show your work. If you get stuck on the math, tell me what the correct answer should be based on your intuition. Incorrect numerical answers based on the correct logic will receive partial credit.

5) Unless the question specifies otherwise, there are no taxes or transaction costs.

6) As always, I expect you to abide by the honor code. I trust that no one will give or receive assistance which gives them an unfair advantage over other students. You may not speak about the exam to anyone who has not yet completed it.

7) The characters and events depicted in this exam are fictitious. Any similarity to actual persons or firms, living or dead, is purely coincidental.

I acknowledge and accept the Honor Code and the restrictions outlined above.

_____

(signature)

Permission to Return Exam in Mailbox

The Family Educational Rights and Privacy Act (FERPA) is intended to protect students from the unauthorized disclosure of their personal information. One aspect of the law would require that graded assignments be either handed out directly to students or be placed in sealed envelopes before placing in mailboxes.

In order to facilitate a quicker turnaround, this release gives permission for this exam to be returned directly to my mailbox in the Jacobs Center.

_____

(signature)

Final Exam

Question (max)	Score
1 (50)	
2 (45)	
3 (85)	
4 (60)	
Final exam (240)	

Course Grade Overall

Assignment	Score
Final exam	
Midterm exam	
Homework	
Course total	

1) Spirit Airlines, Inc. (NASDAQ: SAVE) is an ultra low-cost carrier headquartered in Miami and operating scheduled flights to destinations in the US, Bahamas, Caribbean, and Latin America. Spirit's fuel prices are highly correlated with the economy. Fuel prices rise in booms and fall in recessions.

A) If Spirit Airlines wants to reduce the volatility of their fuel costs, recommend a derivative transaction which the airline can use. Explain briefly. (10)

B) If Spirit Airlines enters into the derivatives transaction you described in A), would their $\beta_{\text{Total Assets}}$ rise or fall? Explain completely. (15)

C) Due to concern about making the lease payments on their airplanes, Spirit Airlines is considering the derivatives transaction you described in A). Prior to making a final decision, their management team researched the derivative positions of their competitors. Why is this relevant? Explain completely. (15)

D) While investigating the derivatives transaction you described in A), Spirit's management team learned that oil prices are expected to fall over the next year. Should they wait for oil prices to fall before entering the contract? Explain completely. (10)

2) Warren Buffett's Annual Letter to Shareholders [February 25, 2012]

A) In his recent letter to Berkshire's shareholders, Warren Buffett writes, "When Berkshire buys stock in a company that is repurchasing shares, we hope for two events: First, we have the normal hope that earnings of the business will increase at a good clip for a long time to come; and second, we also hope that the stock underperforms in the market for a long time as well." Why would Buffett hope that his investment underperforms? Explain completely. (15)

B) There is a phrase on Wall Street "talking your book," which means spreading information that would help your investment positions. For example, shorting a stock and then saying publicly the company is heading to bankruptcy. In his annual letter, Buffett says, ""Talking our book' about a stock we own, were that to be effective, would actually be harmful to Berkshire, not helpful as commentators customarily assume." Why would spreading true information that increases the market value of Berkshire's positions actually be harmful to his shareholders? Explain completely. (15)

C) Berkshire owns two regulated utilities: MidAmerican and BNSF. MidAmerican is an energy company serving the midwestern US and BNSF is one of the largest freight railroad networks in North America. In describing these businesses, Buffett writes, "A key characteristic of both companies is the huge investment they have in very long-lived, regulated assets, with these partially funded by large amounts of long-term debt that is not guaranteed by Berkshire." These businesses could borrow money on better terms (reducing costs for Berkshire's shareholders) if the debt was backed by Berkshire. How does Berkshire NOT backing these loans make MidAmerican and BNSF worth more? Explain completely. (15)

3) Sears/Kmart is continuing to restructure the firm. They spun off their Orchard Supply Hardware stores and sold 11 Sears locations to General Growth Properties (GGP). They are now going to focus on enhancing their current locations. The value of their remaining businesses (Sears and Kmart stores) are worth $5,000M to $11,000M depending in part upon how fast retail sales grow over the near future. The value of their stores also depends upon how shopping trends evolve. If customers continue to go to Big Box retailers with their wide range of products and services, Sears will do better than if customers decide to shop from boutique retail outlets that specialized in a smaller range of products. The possible values of Sears current stores along with the NPV of store renovations are reported in the table below. Assume that Sears has no cash and no debt. The risk-free rate is 2%, the market price of risk is 8.0%, and there are 100M shares outstanding.

	Slow Sales Growth		Rapid Sales Growth			
	Boutique	Big Box	Boutique	Big Box		
State	I	II	III	IV		
Probability	25%	25%	25%	25%		
Value of current stores	5,000	7,400	9,400	11,000		
NPV[Investment]	300	0	0	500		
Pre-Issue Equity Value						
Equity Raised						
Post-Issue Equity Value						

A) The value of their currents stores are worth more when retail sales are growing rapidly than when their growth is slow. What, if anything, does that tell us about Sears' asset β. Be as specific as possible. (5).

B) Sears has the opportunity to renovate or expand its stores, but the value of this will depend upon how fast retail sales grow and how customer's shopping patterns change. If customers continue to frequent big box retailers and retails stales grow rapidly, they will need to expand their current stores. This project has an NPV of $500M but will require they raise $1,000M in external capital. If retail sales growth slowly and customers shift to boutique retail establishments, Sears will need to renovate their existing stores so they feel like a collection of small boutiques. This project has an NPV of $300M and will require they raise $1,000M in external capital. If the market believes the four states are equally likely and the managers have not announced their plans (investment or capital raising), what is the current stock price of Sears? Show your work and explain briefly. Assume the market believes managers know the state and will invest in all positive NPV projects. (15)

C) If the managers announce they are going to raise $1,000M in equity to invest, how much does the stock price change when the announcement is made? Assume the market believes the managers know the state and always invest in positive NPV projects. Explain why the stock market reacts to this news as it does. Assume the market thinks the probability of rapid sales growth is still 50%. (15)

D) What fraction of the equity will the market demand in exchange for $1,000M? Assume the equity issue is a zero NPV conditional on the market's expectation/public information (i.e., the belief that manager's always take all positive NPV projects). Explain your calculation. (15)

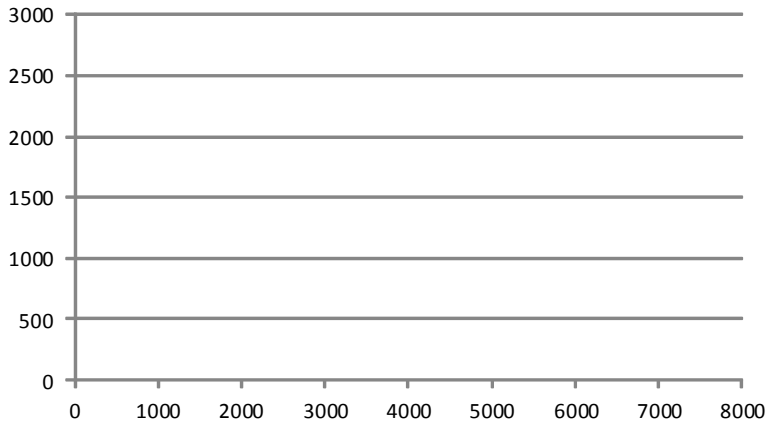
E) Assume the managers can issue equity on the terms you described in D). Will manager's sell equity and invest in the project when the NPV of the project is positive? Explain completely. (20)

F) If manager's maximize the wealth of current shareholders, should they issue equity in any additional states (beyond the ones you described in 3-E)? Explain completely. (15)

4) Molycorp Inc (MCP), the Western Hemisphere's only producer of rare earth oxides, announced last month that they had sold 500,000 shares of convertible preferred equity (CPE). Each share of CPE will pay an annual dividend rate of 5.5% on the $1,000 liquidation value. This dividend rate is high, given MCP's stock currently pays zero dividends (and is expected to pay zero dividend over the next 2 years). Dividends will be paid quarterly with the last dividend payment made on February 1, 2014. The proceeds of the CPE issue will fund MCP's Phase Two expansion which will allow them to produce rare earth oxide (REO) at a rate of 40,000 metric tons per year at their Mountain Pass, California facility. On March 1, 2014, each CPE will convert into shares of common stock. The owner of the CPE does not have the option to covert, conversion always happens. However, the number of shares of common stock that each CPE converts into is uncertain and will be calculated as:

$$Number\ of\ shares\ common\ per\ CPE = Min\left[10, \frac{1,000}{P_{MCP,3/1/2014}}\right] \quad \textbf{(1)}$$

A) Draw the payoff diagram for one share of convertible preferred equity as a function of the asset value of MCP on March 1, 2014. Assume MCP has no debt and there are currently 20M shares of common stock outstanding. Make sure your diagram is completely and clearly labeled. (20)



B) The convertible preferred equity gives investors the opportunity to invest in MCP common stock but with a higher dividend. Should the CPE sell for more or less than 10 times the current stock price based on public information? Explain completely. (15)

C) Suppliers are not technically creditors of the firm. However, suppliers who invest in developing specialized mining equipment for Molycorp Inc. care if the firm survives. Would suppliers be more confident in Molycorp's ability to survive and continue to fund their business if they had issued common equity or the convertible preferred equity with an aggregate liquidation value of $500M [500,000 CPE * 1,000 liquidation value per CPE]? (10)

D) You have been studying the market for rare earth oxides (REO) and the growing demand from the Chinese manufacturing sector. You think the market is under estimating the volatility of the price of REO, but unfortunately there are no traded options on REOs. Would the purchase of MCP common equity or MCP preferred equity be a better way to monetize your view (assuming you are correct)? Explain completely. (15)

Facts and Formulas

Risk premiums:

$$E\left[r_{Market} - r_{risk-free}\right] = 8.0\%$$
$$E\left[r_{Long\ government\ bond} - r_{risk-free}\right] = 1.1\%$$

Return on an asset:

$$r_{asset} = r_{risk-free} + \beta_{asset}\left(r_{market} - r_{risk-free}\right) + \varepsilon$$

Expected rate of return on equity:

$$r_{equity} = r_{asset} + \frac{D}{E}\left(r_{asset} - r_{debt}\right)$$

Annuity formula:

$$PV = \sum_{t=1}^{N} \frac{C}{(1+r)^t} = \frac{C}{r} - \frac{1}{(1+r)^N}\frac{C}{r} = \frac{C}{r}\left[1 - \frac{1}{(1+r)^N}\right]$$

Payoff to options:

$$Call\ Payoff = Max\left[S_t - X, 0\right]$$
$$Put\ Payoff = Max\left[X - S_t, 0\right]$$

NPV of a project:

$$\text{NPV[Project]} = \text{NPV[Project | Capital Structure is Irrelevant]} + \text{NPV[Financing]}$$

Weighted Average Cost of Capital:

$$\text{WACC} = \text{r}_\text{E}\,\frac{\text{E}}{\text{E+ D}} + (1-\tau)\text{r}_\text{D}\,\frac{\text{D}}{\text{E+ D}}$$

1-Year Forward or Futures Price:

$$\text{Futures Price}_0 = \text{E}_0\left[\text{Commodity Value}_1\right]\left(\frac{1+\text{r}_{\text{risk-free}}}{1+\text{r}_{\text{commodity value}}}\right)$$

Solutions to Corporate Finance Final: Practice Exam C

1) Risk Management at Spirit Airlines.

A) They could purchase a forward or futures contract on jet fuel. This contract would require them to pay a fixed price in the future and receive a payment linked to the price of jet fuel in the future. This contract would pay them cash when jet fuel prices are high (and their fuel costs are high) and take cash away when jet fuel prices are low (and their jet fuel costs are low).

B) A company's $\beta_{\text{Total Assets}}$ is the weighted average of the β of all of its assets. Jet fuel prices, and thus being long a forward contract on jet fuel, has a positive β. Therefore, purchasing the contract would raise $\beta_{\text{Total Assets}}$ if the β of jet fuel is greater than β of Sprit's assets and lower $\beta_{\text{Total Assets}}$ if the β of jet fuel is less than the β of Spirit's assets.

C) If Spirit Airlines risk management strategy is to reduce the variability of operating cash flows (e.g., ticket prices minus labor minus fuel costs) so that they have enough cash to make the lease payments on their airplanes, they need to know how ticket prices vary with fuel prices. If Spirit's competitors do not hedge their jet fuel price risk, it is more likely their competitors will raise ticket prices when jet fuel prices rise and, more importantly, lower ticket prices when jet fuel prices fall. Thus to know how much of their jet fuel price risk to hedge, they would like to know their competitors jet fuel price risk exposure.

D) As long as the information is publicly available, the expected price drop in jet fuel prices is already factored into the forward price. Thus there would be no reason to wait and no advantage of trading on this public information. The disadvantage is that Spirit would be exposed to variation in jet fuel prices that they find costly. The only situation in which this information would affect the timing of Spirit's decision is if their knowledge of the impending fall in jet fuel prices was private. They knew but the market did not. This is unlikely.

2) Buffet's Annual Letter to Shareholders and Efficient Markets.[1]

A) Whether you (and Mr. Buffet) prefer the market to undervalue or overvalue a stock depends upon whether you are buyer or a seller. Mr. Buffett wants the market to undervalue the stock of the company he has purchased, so that the company can repurchase its own shares at a profit. If the company's equity is undervalued, it would also be profitable for Berkshire to purchase additional shares directly, but Buffett understands that he is not in the best position to evaluate this investment. The company's managers have better information than Buffett to assess the business's true value.

B) Spreading the information enables other market participants to purchase the undervalued stock and drives up the price, thus improving the value of Berkshire's investment. However, Berkshire's shareholders would do even better if they also received the NPV from buying the undervalued stock. They would receive this if Berkshire bought the stock directly or if the company's managers repurchased equity.

[1] http://www.berkshirehathaway.com/letters/2011ltr.pdf

Whether Mr. Buffet prefers the stock price to rise now or later, depends upon when he plans to sell the stock.

C) Berkshire does not back MidAmerican and BNSF's loans because it puts MidAmerican and BNSF in a better bargaining position with their regulators. MidAmerican and BNSF are well capitalized now, but if there is a negative shock (say extensive flooding that damages BNSF's railway network), Berkshire wants BNSF to be able to negotiate for rate increases or other concessions from the regulator. The regulator is less likely to agree if BNSF has access to Berkshire's deep pockets. Sometimes the inflexibility of debt can be value increasing, for example, when it increases your bargaining power. (10)

3) Sears' Investment and Funding Decisions.

A) As long as retail sales growth is higher when the economy is booming than when the economy is in a recession, this means Sears' asset β is positive (e.g. their asset value rises above expectation in booms and falls below expectation in recessions).

	Slow Sales Growth		Rapid Sales Growth		Before Equity Issue Announced	After Equity Issue Announced[2]
	Boutique	Big Box	Boutique	Big Box		
State	I	II	III	IV		
Probability	25%	25%	25%	25%		
Value of current stores	5,000	7,400	9,400	11,000	8,200	8,000
NPV[Investment]	300	0	0	500	200	400
Pre-Issue Equity Value	5,300	7,400	9,400	11,500	8,400	8,400
Equity Raised	1,000			1,000		1,000
Post-Issue Equity Value	6,300			12,500		9,400

B) The stock price is $84/share before the managers make an announcement. Prior to an announcement, the market assumes that managers will invest in the project in the slow growth/boutique state and in the rapid growth/big box state. Since all four states are equally likely, the expected value of the assets (and equity) is 8,400M. This includes the value of the current stores and the NPV of the project (which the market assumes the managers will take). Because there are 100M shares outstanding, the stock price is $84/share.

C) The stock price will not change when the managers announce the equity issue. The market believes the managers invest in positive NPV projects and knows that Sears does not have the cash to make the investments. Thus the announcement reveals that the true state is either slow growth/boutique (state I) or rapid growth/big box (state IV). In this case, the expected value of the project rises from 200 to 400 (good news).

[2] These are the expected values conditional on an equity announcement. These are the expected values conditional on it being state I or IV.

Originally the market thought there was a 50% probability that Sears had a positive NPV project, now they know they do. However, the value of the current stores falls from 8,200 to 8,000 (either 5,000 or 11,000). Because the total equity (asset) value has not changed, neither has the stock price. The question asks both *how* the stock price reacts and *why* it does. For full credit, an answer had to explain that the reason the stock price didn't change is that the expected project value increased by the same amount as the expected asset value decreased.

D) The market will demand 10.6% of the equity. The value of the equity (post-issue) is the 8,000 value of the stores (assets in place) plus the 400 NPV of the project plus the 1,000 contribution by the new equity holders. Thus for 1,000, the market will demand 10.6% of the 9,400M equity value.

$$1{,}000 = k\left[8{,}000 + 400 + 1{,}000\right]$$
$$k = \frac{1{,}000}{9{,}400} = 0.106 \qquad \textbf{(1)}$$

E) Managers will issue equity when the NPV of the project is positive. The equity issue is not a zero NPV in either state I or state IV. In state I (slow growth/boutique) the NPV of the equity issue is positive. Since the combination of investing and issuing equity raises current shareholder's wealth, Sears' managers will issue equity and invest. In state IV (rapid growth/big box) the NPV of the equity issue is negative, but the magnitude of the loss is less than the NPV of the project. Because the combination of investing and issuing equity raises current shareholder's wealth, Sears' managers will issue equity and invest in this case as well. The equity issue is mispriced but not enough to distort the investment decision in this case.

$$\text{NPV}\left[\text{Project}\right] = \text{NPV}\left[\text{Project}|\text{CSI}\right] + \text{NPV}\left[\text{Financing}\right]$$
$$\text{NPV}\left[\text{Project}_{SG/Boutique}\right] = 300 + \left[1{,}000 - 0.106\left(6{,}300\right)\right]$$
$$= 300 + \left[330\right] = 630 \qquad \textbf{(2)}$$
$$\text{NPV}\left[\text{Project}_{RG/Big\ Box}\right] = 500 + \left[1{,}000 - 0.106\left(12{,}500\right)\right]$$
$$= 500 + \left[-330\right] = 170$$

F) Managers maximize current shareholders wealth by investing when the NPV of the project (assuming capital structure is irrelevant) plus the NPV of financing is positive. In states II and III, Sears does not have a positive NPV project in which to invest. However, if the market is willing to pay \$84/share (pay \$1,000M for 10.6%) for the firm, then the equity issue is a positive NPV in state 2. Thus, managers can maximize current shareholders wealth by issuing equity in state 2 as long as they invest it in a zero (or not too negative) NPV project. Since correctly priced financial securities are a zero NPV investment, this is easily done.

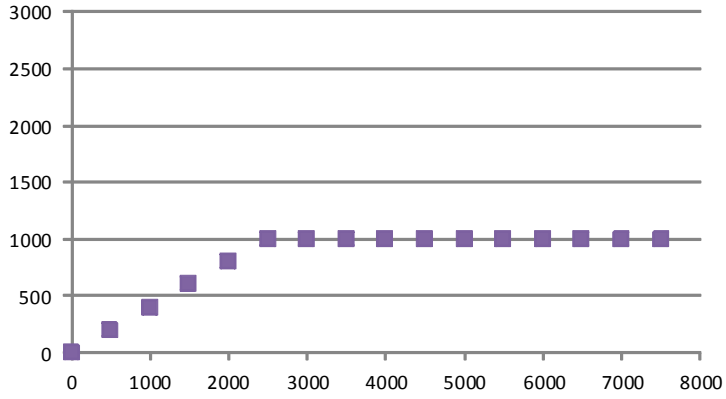
$$\text{NPV}\left[\text{Project}\right] = \text{NPV}\left[\text{Project}|\text{CSI}\right] + \text{NPV}\left[\text{Financing}\right]$$
$$\text{NPV}\left[\text{Project}_{SG/Big\ Box}\right] = 0 + \left[1{,}000 - 0.106\left(7{,}400 + 1{,}000\right)\right]$$
$$= 0 + \left[1{,}000 - 894\right] = 106 \qquad \textbf{(3)}$$
$$\text{NPV}\left[\text{Project}_{RG/Boutique}\right] = 0 + \left[1{,}000 - 0.106\left(9{,}400 + 1{,}000\right)\right]$$
$$= 0 + \left[1{,}000 - 1{,}106\right] = -106$$

4) Molycorp Mandatory Convertible Preferred Equity.[3]

A) The convertible preferred equity has a liquidation value (like a face value) and a specified dividend rate and is convertible into common equity. Thus far the security sounds like a convertible bond. The difference is the owner of the CPE does not have the option (choice) to convert; conversion is mandatory. The number of shares into which the CPE converts, however, is variable. At most the CPE owner receives 10 shares, but may receive fewer. Thus the payoff to the CPE owner on March 1, 2014 is:

$$CPE\ Payoff = P_{MCP,3/1/2014}\ Min\left[10, \frac{1,000}{P_{MCP,3/1/2014}}\right] = Min\left[10\,P_{MCP,3/1/2014}, 1,000\right] \quad \textbf{(4)}$$

Thus the owner of the CPE receives 10 shares of stock when they are worth less than 1,000 and 1,000 otherwise. Thus the payoff diagram will have one kink at the point where the stock price is equal to 100/share. Above this point, the payoff is 1,000. Below this point, the payoff is 10 shares of stock. There are currently 20M shares outstanding. When the stock price is less than or equal to 100, the CPE will convert into 5M new shares.[4] Thus when the stock price is 100, there will be 25M shares outstanding and the total asset (and equity) value will be 2,500M. At asset values below 2,500M, the payoff to one CPE is ten times the stock price or the asset value divided by 2.5M.



For those of you dying to figure out how to calculate the stock price when the asset value is above 2.5B, read on. There are two ways to think about this that lead to the same answers. With the first approach, when the asset value is above \$2.5B (the stock price is above \$100), the preferred owners are owed an aggregate amount of \$500M (500K shares of preferred times \$1000/share). Thus we can think of the preferred as like debt with a payment of 5M. Since there are 20M common shares outstanding, the stock price is:

$$P_{MCP\,Common} = \frac{Asset - 500M}{20M} = \frac{5,000 - 500M}{20M} = 225 \quad \textbf{(5)}$$

[3] http://www.businesswire.com/news/home/20110210007275/en/Molycorp-Announces-Pricing-Mandatory-Convertible-Preferred-Offering

[4] There are 500,000 CPE outstanding which convert into 10 shares each if the stock price is 100 or less. This would create 5M new shares or 25M shares total.

So if the asset value is 5B, then the stock price is 225. To complete the logic, if the stock price is 225, then the convertible preferred will convert into 2,222,222 shares. If the total number of shares outstanding is now 22,222,222, and the asset value is 5B, then the stock price should be 225 [5,000M/22.2M].

This leads to the second method. The stock price is the asset value divided by the total number of shares. The total number of shares, of course, depends upon the stock price. Thus, we can write this logic out as:

$$P_{MCP\,Common} = \frac{Asset}{\left(20M + \frac{500M}{P_{MCP\,Common}}\right)}$$

$$P_{MCP\,Common}\left(20M + \frac{500M}{P_{MCP\,Common}}\right) = Asset \qquad \textbf{(6)}$$

$$20M\ P_{MCP\,Common} + 500M = Asset$$

$$P_{MCP\,Common} = \frac{Asset - 500M}{20M}$$

which is where we started with the first method.

B) The CPE could sell for more or less than 10 times the MCP stock price. The CPE can be constructed as 10 shares of CPE plus the extra dividends (5.5% of 1000) minus warrants on CPE stock with a strike price of 100. Notice that the upside above 100 a share has been sold off (see picture above). Because the CPE is more valuable (because of the higher dividends) and less valuable (because it is short 10 call options), we can't tell whether is should be worth more or less than 10 shares without knowing the value of the calls and the value of the extra dividends.

$$V_{CPE} = 10\,P_{MCP\,Common} + PV\left[Dividend\ 5.5\%\ of\ 1{,}000\right] - Warrants\left[S = P_{MCP}, X = 100\right] \qquad \textbf{(7)}$$

C) The preferred differs from the common in a couple of dimensions (and not in others). First, the preferred pays a 5.5% dividend and the common does not. Thus the preferred takes capital out of the firm ($27.5M annually). Second, the preferred has sold off the upside, but since this does not occur in bad states of the world, this will not be an issue for suppliers. Finally, the preferred has a liquidation value of $500M, but this amount is never "due" to the convertible preferred. The convertible preferred always converts into common equity. The number of shares vary, but there is never a situation where Molycorp has to come up with cash to pay off the preferred owners. They always give them newly printed shares of common stock. Thus the suppliers would have a slight preference for the common because of the lower dividend yield.

The mandatory convert are favored by issuers who want flexibility and equity capital in bad states of the world. Thus you see extensive discussion about whether banks should and will issue mandatory convertibles (debt or preferred equity) since they convert into common equity (capital) just when the bank needs it.

D) You want to purchase Molycorp stock. You want to purchase options on REO but none exist. The next best option is to purchase options on a producer of REO such

as Molycorp Inc. The convertible preferred are like 10 shares of stock minus call options, so this is the wrong trade. Being short options is a way to monetize the view that the market is over estimating volatility of Molycorp's equity or assets (or volatility of REO prices). However, if the convertible preferred owners are short calls, then the common equity owners are long the calls (the preferred owners had to sell the calls to someone). The preferred owners sold the upside above 100/share to the common equity owners. Thus each share of common equity is like owning a fraction (1/2.5M) of the assets plus having a fraction of call on Molycorp's assets. Since you want to buy call options on REO assets, Molycorp's common equity is better than buying Molycorp's convertible preferred equity.