

**Problem Set 6 for Economics 180.367:
Investments and Portfolio Management
Due at the beginning of class on November 11.**

Note: Point totals are shown at the beginning of each question. It is important to show your work.

1. (20 pts) Suppose that John and Jane entered into an overnight index swap (OIS) agreement on July 1, 2011. John agreed to pay the floating rate (the average effective federal funds rate over the next three months). Jane agreed to pay fixed. The notional underlying was \$100 million. What money changed hands and when? [Note: the floating rate of the OIS contract is set to the effective federal funds rate, and you may assume that John paid the average Federal Funds rate for the third quarter of 2011. The Federal Funds rate is available on Bloomberg as FEDL01 Index.]

2. (30 pts) Consider the following risky bonds:

Bond	Maturity (Years)	Face Value (\$)	Coupon (%)	Price (\$)
X	2.0	\$1,000	0%	\$700
Y	2.0	\$1,000	0%	\$800

The riskfree interest rate is 6 percent per annum. Each bond has a 10 percent chance of default. In the event of default, bond X has a zero payoff; bond Y has a payoff of \$500.

A collateralized debt obligation (CDO) pools risky debt securities X and Y into an investment vehicle that is sold off in reconfigured pieces called tranches. Cashflows from the original securities are passed-through to the tranches according to a specific rule. The rule is generally hierarchical in the sense that there is a most senior tranche that receives the first \$P payments, a more junior tranche that receives the next \$Q payments, and so forth.

Consider a CDO obtained by pooling one bond of X and one bond of Y. The senior tranche has a face value of \$500 and the junior tranche has a face value of \$1500.

- (a) What is the value of the junior tranche?
- (b) What is the promised yield to maturity on the junior tranche? Is it different from that of the senior tranche? Why?

3. (10 pts) Consider a CDO made up of three zero-coupon bonds, each with a face value of \$100. Each bond has a default probability of 10 percent, and there is no recovery following default. The most senior tranche of this bond has a face value of \$100.

- (a) If defaults on the bonds are independent of each other, what is the default probability for the most senior tranche of the CDO?
- (b) If defaults are perfectly correlated (i.e. either all bonds default or none do), what is the default probability of the most senior tranche of the CDO?

4. (20 pts) Consider a CDO made up of 100 bonds, each of which will either default immediately (being worthless) or pay off \$1. The CDO has three tranches: senior, mezzanine and junior with face values of \$70, \$20 and \$10 respectively. The prices of the senior, mezzanine and junior tranches are \$65, \$10 and \$2. Consider a strategy of buying one unit of the mezzanine tranche and shorting one unit of the senior tranche. How many bonds would need to default for this strategy to make money? [Hint: there are two ways that this strategy will make money. Either X or more bonds default, or Y or fewer bonds default. You need to find X and Y].

5. (20 pts) On October 31, 2011, what was the price of a call option to buy a GE share on November 19, 2011 at a strike of \$16? What was the price of a put option at the same strike and for the same date? What was the price of a GE share? Treating the risk-free interest rate as zero, are these prices consistent with put-call parity?