TARP WARRANTS CASE

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**Question 1.**
If you were to advise the U.S. Treasury (UST), how would you tell them to choose the interest rates, dividends, and volatility assumptions to use to value the bank warrants in this case? Explain your recommendations. Which choices are conservative from UST's point of view?

**SOLUTION:**

According to us, the United States Treasury needs to look at both sides: It needs to represent the benefits of tax payers but at the same time, it should ensure that the institutions get out of financial crisis. In order to achieve this, the model chosen by United States Treasury based on its assumptions should be as fair as possible to ensure appropriate pricing of warrants. Now, if the United States Treasury chooses a conservative approach and the assumptions are made according to that approach, then the value of warrants will be very low. This means that the financial institutions could get out of trouble at the cost of tax payers' benefits. This would not be fair to the tax payer. Now looking on the alternative approach which means that if United States Treasury chooses an aggressive approach in modelling the value warrants, then the warrants would have to be repurchased by the financial institutions at a great cost. Hence, there needs to be a balance and the United States Treasury should set a reasonable approach which can lead to a fair value. This would mean that the risk-free rate, dividend pay-out ratio and volatility should be chosen as the median of the highest to the lowest estimates.

From the point of view of the United States Treasury, the choice of dividends should be conservative. This is because, the financial institutions just got out of crisis and the they could not be able to pay very high dividends. Additionally, the choice of volatility should also be conservative. This is because, as the market is unstable, the price of stock could be very volatile.

**Question 2.a**

The case mentions that UST applies a "liquidity discount" to its model valuations for small banks. They refer to short-sales cost for the stock as part of this discount. How big a short-sale cost would you need to include in a 10-year ATM American call valuation to reduce the theoretical value by 50%?

**SOLUTION:**

We believe the short-selling cost to be a kind of dividend. But, since this option is traded in an American way, even if we look at it as a special kind of dividend we still are not able to use Black-Scholes model to solve the problem.

Here, we need to be able to use a special method to deal with these kinds of problem. Even though we see short-selling cost as a special kind of dividend, we would still try to use Black-Scholes since, it is the most efficient model that we have to help us solve the problem. In order to use Black-Scholes, we need dividend yield, risk-free rate and volatility to get the price of option. The bond rate for the 1 year US Treasury bond can be found by using the history data which is 1.237%. And for volatility, we use the S&P data which is 44.81%. Using these numbers, we can get the value of an at-the-money American Call option which is about 45. We need to add dividend to the Black-Scholes formula to make this number half.

Finally, we find the dividend which is about 12.15%. This means a 12.15% short selling cost is needed to make the price of an option become half.

**Question 2.b** Suppose a company's stock is illiquid and we can model this by assuming a 1% transaction cost whenever we buy or sell shares. (Assume now there is no borrowing fee.) If you were a dealer and a customer wanted to buy a call from you, would the cost of trading the stock raise or lower the price at which you would be willing to sell the call?

**SOLUTION:**

We would be willing to sell the call option at a higher price if there is a cost of trading the stock at a 1% transaction cost whenever we buy or sell the shares.

As we know that the put-call parity exists, we can always duplicate an option with the underlying stock and a risk-free asset. Now, if the cost of trading the underlying stock increases, the cost of duplicating the option will be higher. As a result, the price of the option will increase. However, if the price of the option stays the same, there exists an arbitrage opportunity to short the duplicated portfolio and long the option.

**Question 2.c**

What about the illiquidity of the warrants themselves? Does the valuation model rely on the assumption the warrants are traded (in a liquid market)? Does the lack of a secondary market mean that the banks should pay more or less for them?

**SOLUTION**

The valuation model does rely on the assumption that warrants are traded. Suppose the warrants are traded in a very illiquid market, then in order to be able to sell the warrant, the holder may lower the price. As a result, the model would provide a lower price of the warrant. So, when the banks wants to repurchase the warrant, it would pay less because the illiquidity lowers the value of the warrant according to the valuation model.

**Question 3.**

The banks who sold the warrants have the right to extinguish half of them if they make a "qualified equity offering" within a certain period of time. Why do the COP analysts not discount the warrant value due to this feature? How much money could Goldman Sachs save its shareholders by making such an offering?

**SOLUTION**

United States Treasury applied a cash-takeout discount for some of the smaller banks to account for the risk that a bank could be purchased for cash in a takeover. A warrant holder would have to exercise the option right away if such a takeover happens. If such a takeover does not happen, then the underlying shares of the warrant would disappear and there would be no value for the warrant anymore. When the holder of the warrant has to face this decision between exercising the warrant immediately and losing the warrant, the price might not yet be in favor of him/her. For example, the underlying share prices might still be lower than strike price of the warrant. Such situation would definitely add more risk to the warrant holder, which would then lower the value of the warrant.

The substitution clause states indicates that if the bank is purchased for cash in a takeover, the United States Treasury would have the option to exchange the warrants they hold into senior term debt or another economic instrument or security of the bank, to compensate United State treasury's position. As a result, the UST's risk would be largely reduced by a substitution clause when a takeover takes place.

**Question 4.**

Summarizing, whose arguments do you think are better: UST or COP? Specifically, do you agree with UST that the fair value for the warrants should be worth substantially less (e.g. 50% less) than standard no-arbitrage models would imply?

**SOLUTION**

If we compare to the case above, we believe that the COP is doing a better job. There will be a negative impact on the market if we make the bank warrants too low. For instance, if the warrants are sold at 30% of their standard valuation model, this will give an indication to the market and to the investors that there must be something wrong with the bank or company, or they would not want to sell the warrants at this low price. This might create a panic and the stock price of the bank which is selling the warrant might drop further. The reason that the warrant price were set low is so that they could reduce the risk for the company. However, if the valuation of warrants is that low, it won't help the company that much, which means taking the price of warrants to a low level would not be of much help and does not make sense.

If it is possible, the best strategy would be to come up with is to set the value of warrants between COP and UST. This would be the best of both worlds as the price now obtained would have both side's advantages to help the financial market in a healthy environment without wiping out anyone's benefits, which is a perfect situation for most companies.